

DEEP-SEA COPEPODA (SIPHONOSTOMATOIDA) FROM HYDROTHERMAL SITES ON THE MID-ATLANTIC RIDGE AT 23° AND 37°N

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ABSTRACT

Eleven species of Dirivultidae (Copepoda: Siphonostomatoida) have been found at deep-sea vent areas on the Mid-Atlantic Ridge at the Snake Pit site, 23°23'N, 44°56'W, depth 3,500 m, and near the Azores at the Lucky Strike site, 37°N, 32°W, depth 1,620 m. *Rimipontius mediospinifer* new genus, new species, is characterized by the formula 0-0; 1 for the endopod of leg 4 and by the presence of five setae on each caudal ramus. *Aphotopontius atlanteus* new species is distinguished by the length of the caudal ramus and by details of the genital double-somite in the female. *Stygiopontius cladarus* new species is noted for its small subdrate caudal ramus; *S. serratus* new species for the serrate nature of posterior margin of the antennule; *S. teres* new species in the female for its smooth expansions of the genital double-somite and the angular margin on leg 5; *S. regius* new species for its large broad undivided leg 5 in the female and its irregularly shaped spermatophore; *S. bulbisetiger* new species for the bulbous setae on the antenna; *S. mirus* new species for the prolongation of the coxa of the maxilliped with a terminal clawlike process; and *S. latulus* new species for the unusually broad prosome. Two copepods show a disjunct distribution: *Aphotopontius forcipatus* Humes, 1987, previously known only from the northeastern Pacific, is reported for the first time in the Atlantic; *Stygiopontius pectinatus* Humes, 1987, reported originally from the Mid-Atlantic Ridge and known also from the Mariana Back-Arc Basin, is recorded in large numbers from the hydrothermal site at 23°23'N, 44°56'W.

Numerous species of siphonostomatoid copepods have been reported from deep-sea vents and cold seeps (in the eastern Pacific: Humes, 1984, 1987, 1988a, 1988b, 1989a, 1989b, 1989c, 1990a; Humes and Huys, 1992; in the western Pacific: Humes, 1990b, 1991; in the Gulf of Mexico: Humes, 1988b; on the Mid-Atlantic Ridge: Humes, 1987). At present nine species of *Aphotopontius* Humes, 1987, and 14 species of *Stygiopontius* Humes, 1987, are known from these areas.

Several dirivultid copepods are associated to some degree with invertebrates (vestimentiferans, alvinellid polychaetes, crustaceans) at deep-sea vents. Two species appear to have a direct association with deep-sea decapod crustaceans. *Stygiopontius pectinatus* Humes, 1987, has been found with the shrimps *Rimicaris exoculata* Williams and Rona and *Chorocaris* (= *Rimicaris*) *chacei* (Williams and Rona) (see Martin and Hessler, 1990) at the Mid-Atlantic Ridge (Humes, 1987) and in washings of the tubes of the polychaete *Paralvinella hessleri* Desbruyères and Laubier at the Mariana Back-Arc Basin (Humes, 1990b). *Aphotopontius acanthinus* Humes and Lutz, 1994, has been observed on the carapace of the deep-sea crab *Bythograea thermydron* Williams at the East Pacific Rise (Humes and Lutz, 1994).

In this paper *Rimipontius mediospinifer* new genus, new species, one new species of *Aphotopontius*, and seven new species of *Stygiopontius* are described, all from hydrothermal sites on the Mid-Atlantic Ridge north of the equator. In addition, *Aphotopontius forcipatus* Humes, 1987, and *Stygiopontius pectinatus* Humes, 1987, are recorded from these sites.

MATERIALS AND METHODS

The material examined came from two hydrothermal sites at the Mid-Atlantic Ridge. Of 11,162 copepods, 132 were collected at the Lucky Strike hydrothermal vents area (300 miles southwest of

the Azores, 37°11'N, 32°16'W, depth 1,626–1,700 m), during the American cruise Lucky Strike (ALVIN/R. V. ATLANTIS II, chief scientist Charles Langmuir (Lamont-Doherty Earth Observatory), 27 May–4 June 1993). The other 11,030 individuals were collected at the Snake Pit hydrothermal areas (23°23'N, 44°56'W, depth 3,500 m), during the French American cruise MAR 93 (ALVIN/R. V. ATLANTIS II and NO/J. CHARCOT, chief scientists Cindy Van Dover (Woods Hole Oceanographic Institution) and Aline Fiala (Université Paris VI). The copepods were found in washings of samples collected by a slurp gun among clusters of the shrimp *Rimicaris* (Snake Pit site) and the water surrounding the mussels *Bathymodiolus* sp. (Lucky Strike site). The copepods were sorted by the sorting center, Centre National de Tri d'Océanographie Biologique (CENTOB), Institut Français de Recherche pour l'Exploitation de la Mer (IFREMER), Brest, France, for study.

The copepods were measured and studied in lactic acid, using the wooden slide method described by Humes and Gooding (1964). The length of the body does not include the setae on the caudal rami. The segments of the antennule were measured along their posterior nonsetiferous margins. In the formulas for the armature of legs 1–4, Roman numerals indicate spines, Arabic numerals represent setae. All drawings were made with the aid of a camera lucida. In the figure legends the letter after each figure refers to the scale at which it was drawn.

Order Siphonostomatoida Thorell, 1859
Family Dirivultidae Humes and Dojiri, 1980

***Rimipontius* new genus**

Diagnosis.—Dirivultidae. Resembling *Aphotopontius* and *Stygiopontius*, but differing in having only 5 setae on caudal ramus, innermost terminal seta having been lost; leg 4 with endopod having formula 0-0; I; and genital double-somite in female having median spiniform process on posterior dorsal margin.

Type-species.—*Rimipontius mediospinifer* new species.

Gender.—Masculine.

Etymology.—The generic name is a combination of *rima*, Latin meaning a cleft or fissure, alluding to the Mid-Atlantic Ridge, and the Greek word *pontios*, in the sea, frequently used in generic names of siphonostomatoids.

Remarks.—*Rimipontius* is close to *Aphotopontius* Humes, 1987, and *Stygiopontius* Humes, 1987. However, the new genus may be distinguished by the formula 0-0:I for the endopod of leg 4, and by the caudal ramus bearing only five setae instead of the usual six.

***Rimipontius mediospinifer* new species**

Figures 1a–d, 2a–i, 3a–h, 4a–e

Type Material.—15 ♀♀, 5 ♂♂, Mid-Atlantic Ridge, MAR 93 dive M10-2618, 23°23'N, 44°56'W, Snake Pit site, depth 3,490 m, with *Rimicaris*, 19 June 1993. Holotype ♀ (USNM 268303), allotype ♂ (USNM 268304), and 15 paratypes (12 ♀♀, 3 ♂♂) (USNM 268305) deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D.C. Remaining paratypes (2 ♀♀, 1 ♂ dissected, 2 ♀♀ entire) in the collection of the author.

Other Specimens.—2 ♀♀, Mid-Atlantic Ridge, MAR 93 dive M11-2619, 23°23'N, 44°56'W, Snake Pit site, in approximately 3,500 m, from washing of *Rimicaris*, 20 June 1993.

Female.—Body (Fig. 1a, b) with broad prosome. Length 0.95 mm (0.84–1.01 mm), greatest width 0.42 mm (0.37–0.46 mm), based on 10 specimens. Greatest dorsoventral thickness 0.29 mm. Somite bearing leg 1 fused with cephalosome. Epimera of somites bearing legs 1 and 2 rounded, those of following 2 somites pointed. Ratio of length to width of prosome 1.18:1. Ratio of length of prosome to that of urosome 1.15:1.

Somite bearing leg 5 (Figs. 1c, d, 2a) $83 \times 135 \mu\text{m}$. Genital double-somite in dorsal view 180 μm long including prominent posterolateral spiniform processes,

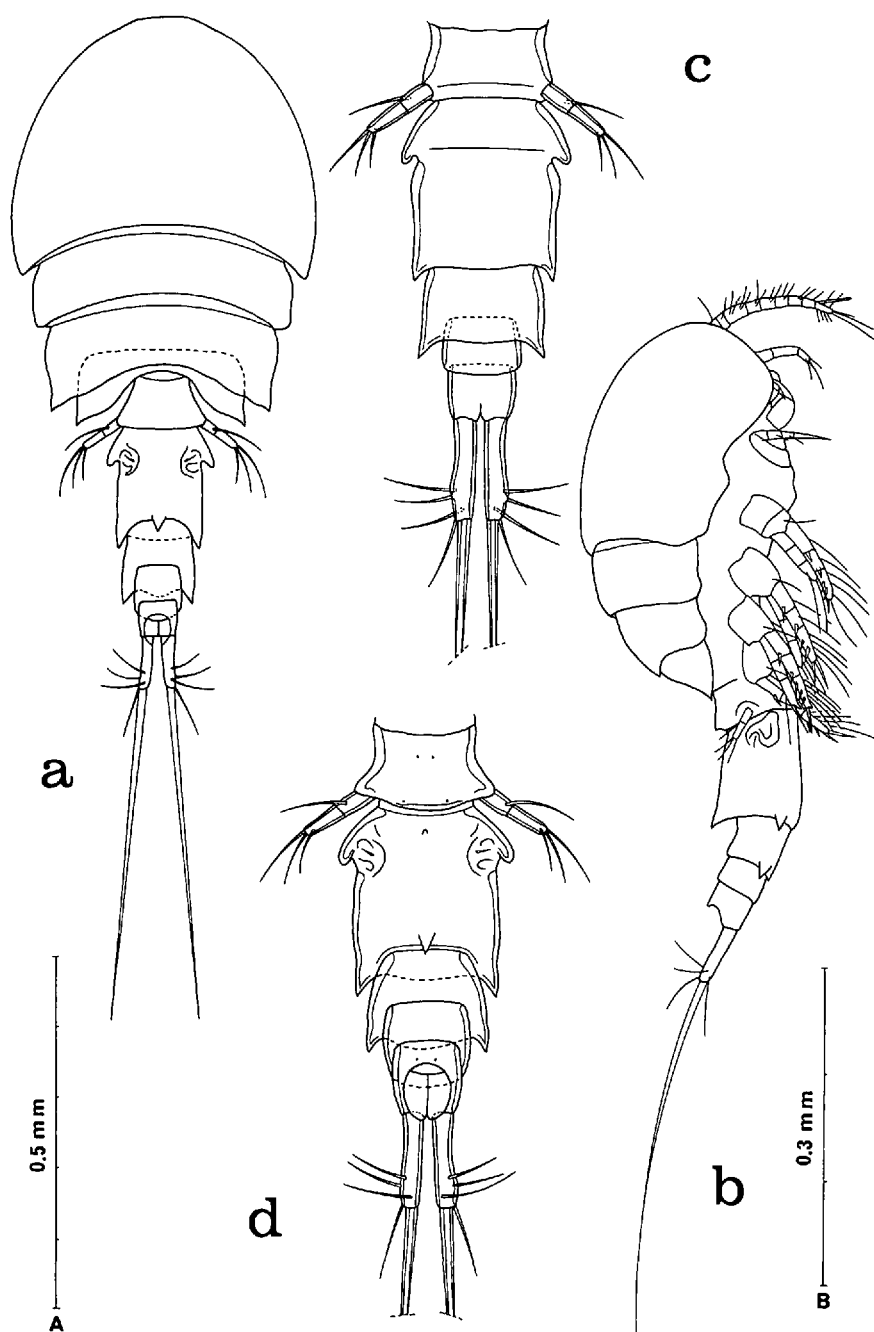


Figure 1. *Rimipontius mediospinifer*, new genus, new species. Female. a, dorsal (scale A); b, lateral (A); c, urosome, dorsal (B); d, urosome, ventral (B).

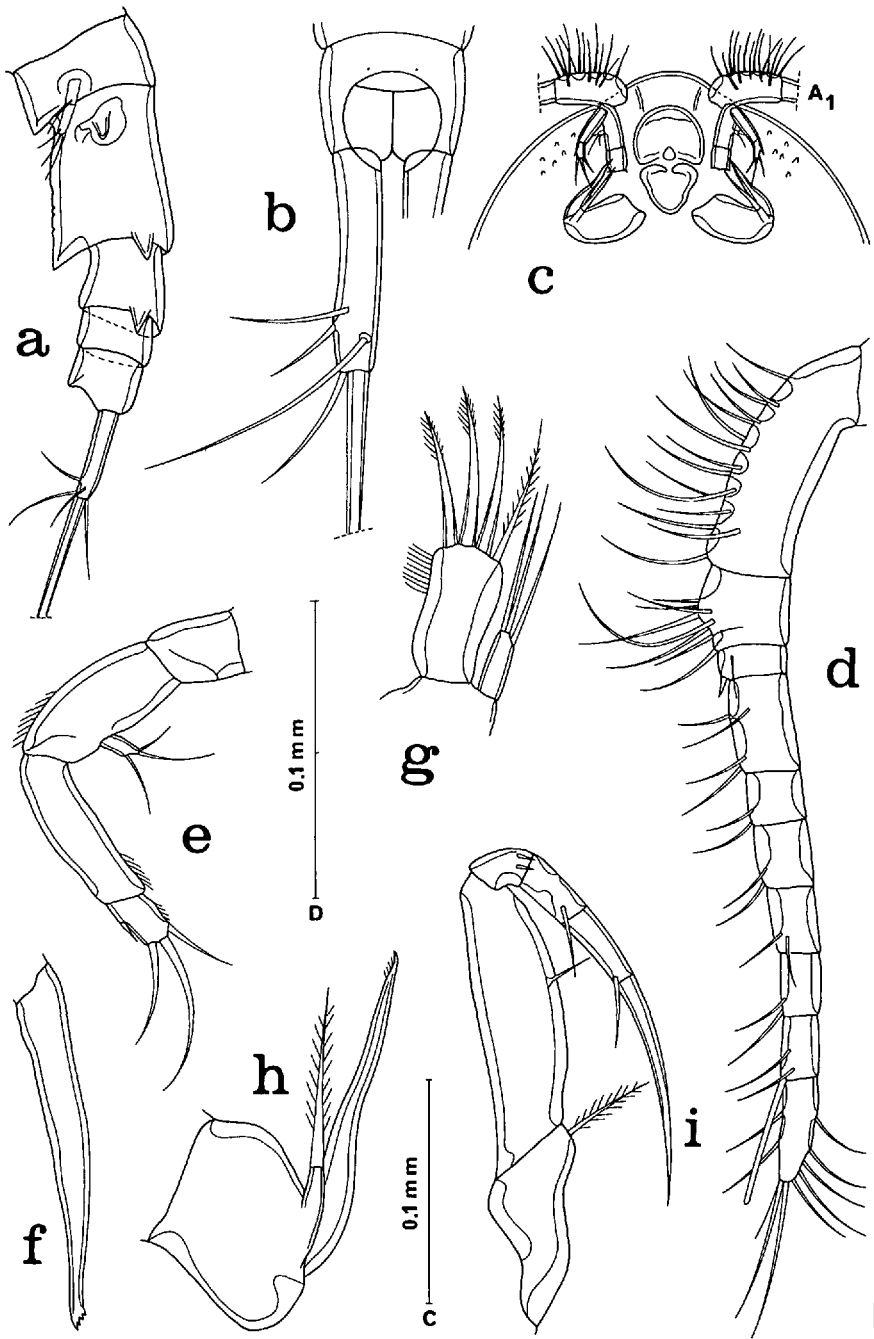


Figure 2. *Rimipontius mediospinifer*, new genus, new species. Female. a, urosome, lateral (scale B); b, anal somite and caudal ramus, dorsal (C); c, oral region, mandibles and maxillules omitted, ventral (D); d, antennule, posteroventral (D); e, antenna, anterior (D); f, mandible, posterior (D); g, maxillule, posterior (D); h, maxilla, posterior (D); i, maxilliped, posterior (D). A1 = antennule.

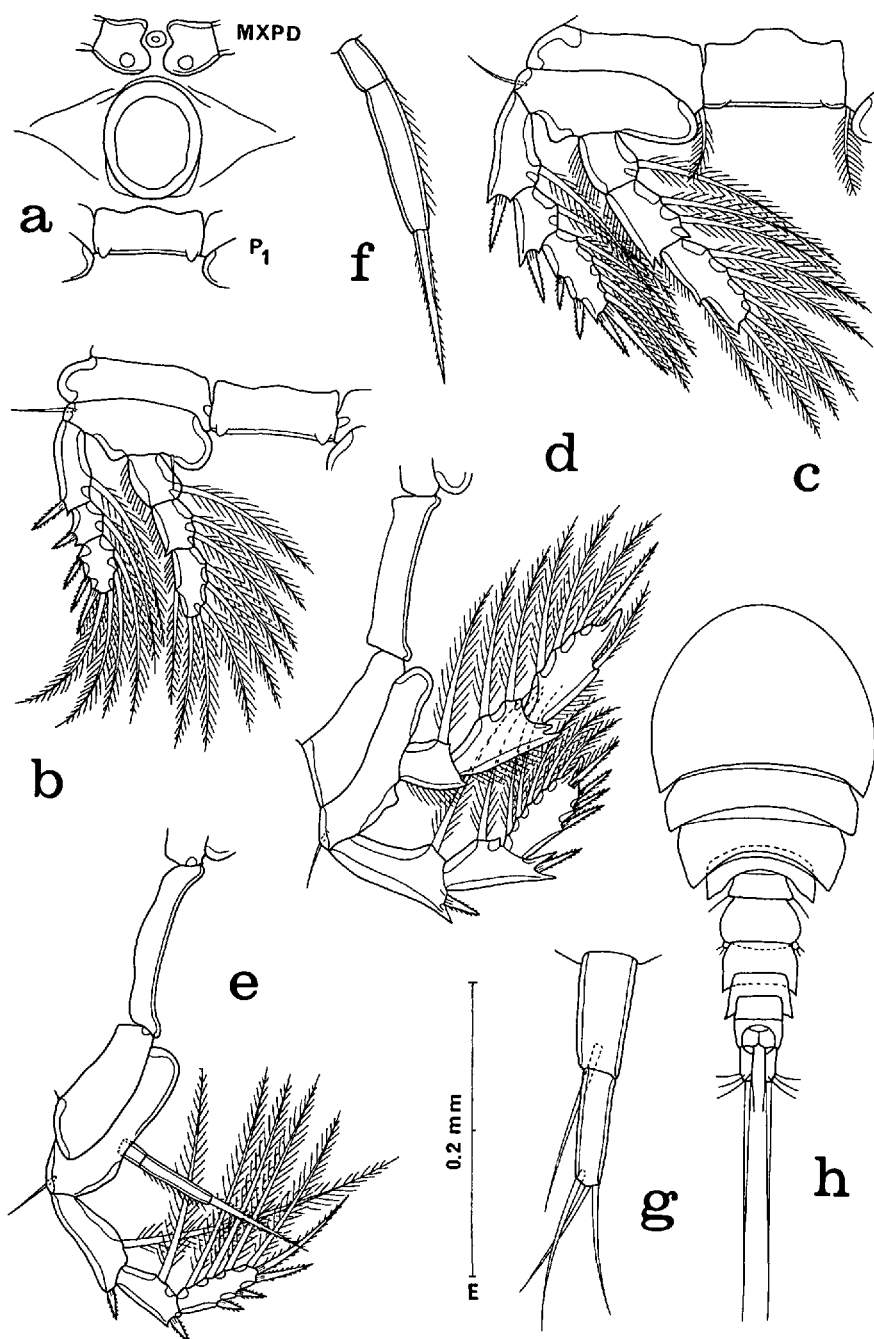


Figure 3. *Rimipontius mediospinifer*, new genus, new species. Female. a, postoral area, ventral (scale E); b, leg 1 and intercoxal plate, anterior (E); c, leg 2 and intercoxal plate, anterior (E); d, leg 3 and intercoxal plate, anterior (E); e, leg 4 and intercoxal plate, anterior (E); f, endopod of leg 4, anterior (D); g, leg 5, dorsal (D). Male. h, dorsal (A). MXP = maxilliped, P₁ = leg 1.

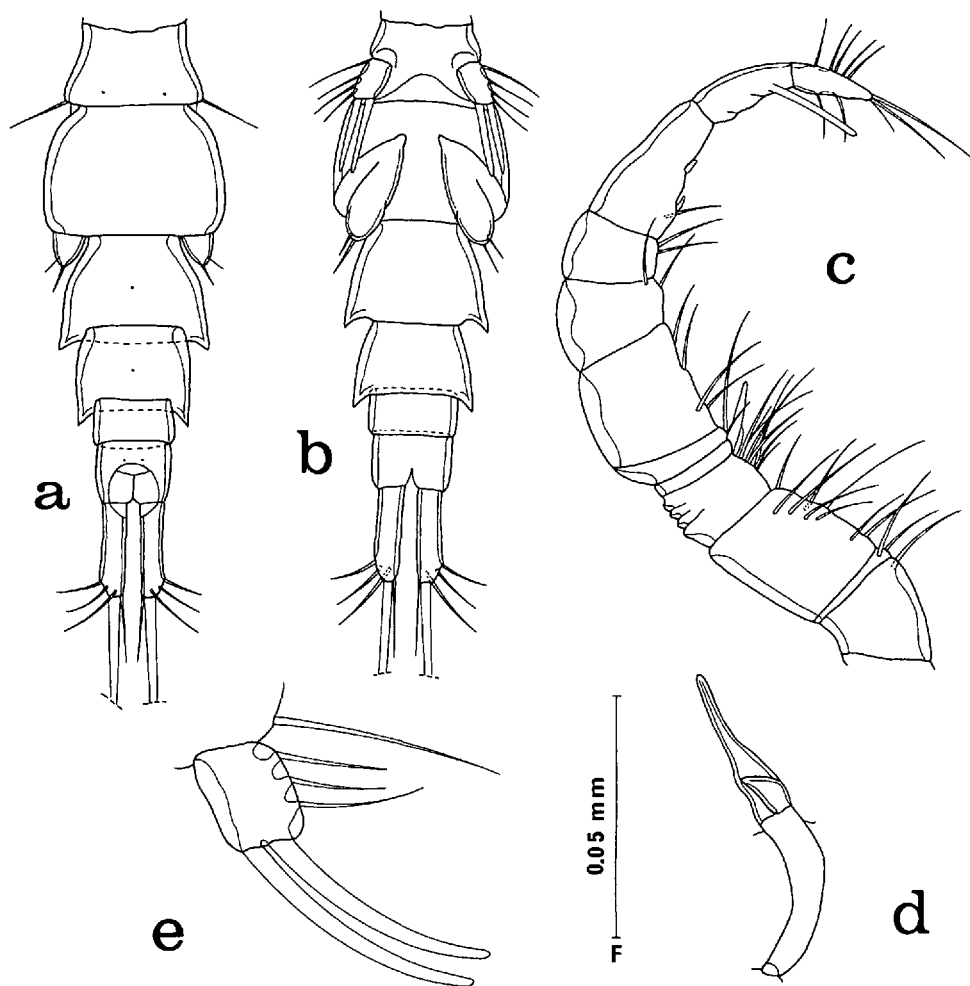


Figure 4. *Rimipontius mediospinifer*, new genus, new species. Male. a, urosome, dorsal (scale A); b, urosome, ventral (E); c, antennule, ventral (D); d, segment 5 of antennule, ventral (F); e, leg 5, ventral (F).

160 μm wide at level of pair of small bluntly rounded lobes on anterior fourth of somite, 138 μm wide posteriorly. Posterior dorsal margin having median spiniform process. Genital areas located dorsolaterally in anterior third of somite. Each area with single small seta. First postgenital somite with pair of conspicuous posterolateral spiniform processes (Figs. 1a, b, 2a). Anal somite tapering slightly posteriorly (Fig. 1c). Three postgenital somites from anterior to posterior 104 \times 112, 62 \times 83, and 57 \times 70 μm .

Caudal ramus (Fig. 2b) elongate, 90 \times 21 μm , ratio of length to width 4.48:1. Outer margin slightly concave. Only 5 setae present. Outer lateral seta, inserted slightly dorsally, 30 μm ; dorsal seta 120 μm ; outermost terminal seta, inserted subterminally, 15 μm ; and innermost terminal seta absent. Two median terminal setae very unequal in length, outer 52 μm , inner 360 μm . All setae smooth.

Body surface smooth except few sensilla on dorsal surface of urosome (Fig.

1c) and group of several sensilla on both sides of ventral surface of cephalosome at level of siphon (Fig. 2c).

Egg sac not seen.

Rostrum not developed (Fig. 2c). Antennule (Fig. 2d) 278 μm long. Lengths of its 10 segments: 57 (83 μm along anterior margin), 21, 13, 29, 19, 20, 20, 19, 19, and 34 μm , respectively. Formula for armature: 15, 8, 2, 4, 2, 2, 2, 2, 2 + 1 aesthete, and 10. All setae amooth. Antenna (Fig. 2e) with short unarmed coxa. Basis elongate with outer setules. Exopod minute, $10 \times 5 \mu\text{m}$, bearing 3 setae. Endopod with long first segment bearing outer distal setules; short second segment with few outer setules and 3 terminal setae plus smaller inner subterminal seta.

Oral cone (siphon) as in Figure 2c. Mandible (Fig. 2f) slender, 114 μm long, with few small terminal teeth. Maxillule (Fig. 2g) with small outer lobe having 3 setae, larger inner lobe with 4 setae, outermost seta more slender than others, and bearing inner distal row of slender setules. Maxilla (Fig. 2h) 2-segmented, with first segment bearing 1 long plumose seta; second segment slightly sinuous with few small subterminal setules. Maxilliped (Fig. 2i) 5-segmented. First segment bearing distal inner plumose seta. Long slender second segment with 1 inner seta. Third segment with 2 small setae and both fourth and fifth segments with 1 seta.

Ventral area between maxillipeds and first pair of legs with sclerotized ring in ventral view (Fig. 3a) and protruding slightly in lateral view (Fig. 1b).

Legs 1–4 (Fig. 3b–e) with 3-segmented rami except for 2-segmented endopod in leg 4. Formula for armature as follows:

P_1	coxa 0-0	basis 1-I	exp I-1; enp 0-1;	I-1; 0-2;	III,2,2 1,2,3
P_2	coxa 0-1	basis 1-0	exp I-1; enp 0-1;	I-1; 0-2;	II,II,4 1,2,3
P_3	coxa 0-0	basis 1-0	exp I-1; enp 0-1;	I-1; 0-2;	III,I,5 1,I,3
P_4	coxa 0-0	basis 1-0	exp I-1; enp 0-0;	I-1; I	II,II,4 I

All legs well sclerotized. Leg 1 (Fig. 3b) with basis having inner setiform spine 17 μm long. Leg 2 (Fig. 3c) with coxa having inner plumose seta; this seta absent in legs 1, 3, and 4. Leg 3 (Fig. 3d) with third segment of both exopod and endopod having stout terminal spiniform process. Leg 4 (Fig. 3e) with exopod 146 μm long. Endopod (Fig. 3f) with short unarmed first segment $13 \times 10 \mu\text{m}$; elongate slender second segment $52 \times 13 \mu\text{m}$ with outer marginal setules and bearing finely barbed terminal spine 63 μm long.

Leg 5 (Fig. 3g) 2-segmented. First segment $39 \times 18 \mu\text{m}$, its seta 57 μm . Second segment $36 \times 12 \mu\text{m}$, its setae 52, 39, and 42 μm . All setae smooth.

Leg 6 represented by small seta on genital area (Fig. 1c).

Color unknown.

Male.—Body (Fig. 3h) resembling that of female. Length 0.64 mm (0.57–0.69 mm), greatest width 0.28 mm (0.26–0.31 mm), based on 5 specimens. Greatest dorsoventral thickness 0.19 mm. Ratio of length to width of prosome 1.18:1. Ratio of length of prosome to that of urosome 1.29:1.

Somite bearing leg 5 (Fig. 4a, b) $57 \times 73 \mu\text{m}$. Genital somite $78 \times 104 \mu\text{m}$, wider than long. Four postgenital segments from anterior to posterior, first 2 with

posterolateral spiniform processes as on first postgenital somite of female, 61×83 , 60×70 , 26×55 , and $39 \times 52 \mu\text{m}$.

Caudal ramus $68 \times 18 \mu\text{m}$, ratio 3.78:1, similar to that of female but smaller. Outer margin of ramus less concave than in female.

Body surface with few sensilla as in female.

Rostrum like that of female. Antennule (Fig. 4c) 12-segmented, geniculate. Lengths of its segments: 13 ($29 \mu\text{m}$ along anterior margin), 3, 36, 21, 5, 8, 34, 23, 21, 42, 29, and $26 \mu\text{m}$, respectively. Armature: 1, 2, 12, 8, 2, 2, 4, 2, 2, 3, 1 aesthete, and 10. Segment 5 with spinelike seta $24 \mu\text{m}$ long and adjacent short stout seta (Fig. 4d). All setae smooth.

Antenna, siphon, mandible, maxillule, maxilla, maxilliped, postoral area, and legs 1–4 as in female.

Leg 5 (Fig. 4e) situated ventrally (Fig. 4b), consisting of segment $29 \times 21 \mu\text{m}$, ratio 1.38:1, bearing 2 inner hyaline broad setae both $47 \mu\text{m}$ and 3 outer setae from distal to proximal 39, 26, and $29 \mu\text{m}$. Adjacent seta on body $55 \mu\text{m}$. All setae smooth.

Leg 6 (Fig. 4b) posteroventral flap on genital somite bearing 2 small setae.

Spermatophore not seen.

Color unknown.

Etymology.—The specific name *mediospinifer*, a combination of Latin *medius*, middle, and *spinifer*, spine bearing, alludes to the median dorsal spine on the female genital double-somite.

Remarks.—Although *Rimipontius mediaspinifer* resembles species of *Aphotopontius* and *Stygiopontius* in features of external anatomy, it may be distinguished from all members of those two deep-sea genera in having a median dorsal spiniform process on the posterior border of the genital double-somite of the female (Fig. 1c). Further distinction may be seen in the posterolateral spiniform processes on the genital and postgenital somites, the female having a pair on the genital double-somite and first postgenital somite (Fig. 1c), and the male having a pair on both first and second postgenital somites (Fig. 4a, b).

The absence of the innermost terminal seta on the caudal ramus, reducing the number of setae to five, seems to be the result of a tendency toward reduction of this seta, as seen, for example, in *Aphotopontius baculigerus* Humes, 1987, and *Stygiopontius lumiger* Humes, 1989.

The formula 0-0; I for the endopod of leg 4 sets the new species apart from both *Aphotopontius*, where the formula is 0-1; I, 1 or rarely 0-1; 1, 1, and *Stygiopontius* where it is 0-0; 1, 1 or 0-0; I, 1. Only one terminal spine is seen also in other dirivultid genera such as *Benthoxynus* Humes, 1984, and *Exrima* Humes, 1987.

The slightly concave outer margin of the caudal ramus in *Rimipontius mediaspinifer* is a useful distinguishing feature. A similar concave margin occurs in *Aphotopontius arcuatus* Humes, 1987.

Aphotopontius Humes, 1987

Aphotopontius atlanteus new species

Figures 5a–f, 6a–h, 7a–e, 8a–c

Type Material.—122 ♀♀, 1 ♂, near the Azores, ATLANTIS/ALVIN dive 2605, $37^{\circ}20'N$, $32^{\circ}17'W$, Lucky Strike site, in 1,636 m, 31 May 1993 (Daniel Desbruyères collector). Holotype ♀ (USNM 268306), allotype (USNM 268307), and 100 paratype ♀♀ (USNM 268308) deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D.C. Remaining paratypes (6 ♀♀ dissected, 9 ♀♀ entire) in the collection of the author.

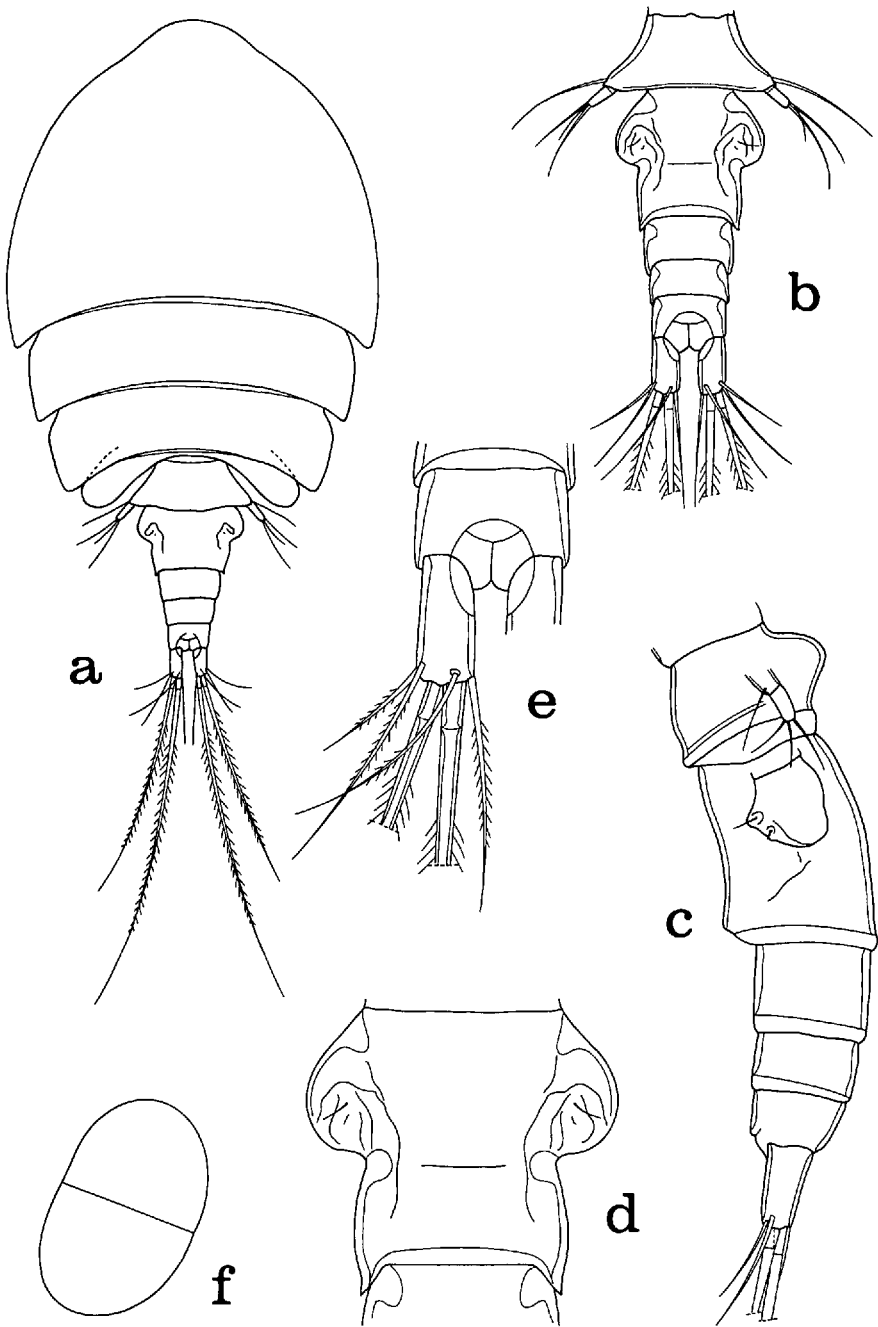


Figure 5. *Aphotopontius atlanteus*, new species. Female. a, dorsal (scale A); b, urosome, dorsal (B); c, urosome, lateral (E); d, genital double-somite, dorsal (C); e, anal somite and caudal ramus, dorsal (C); f, egg sac, ventral (A).

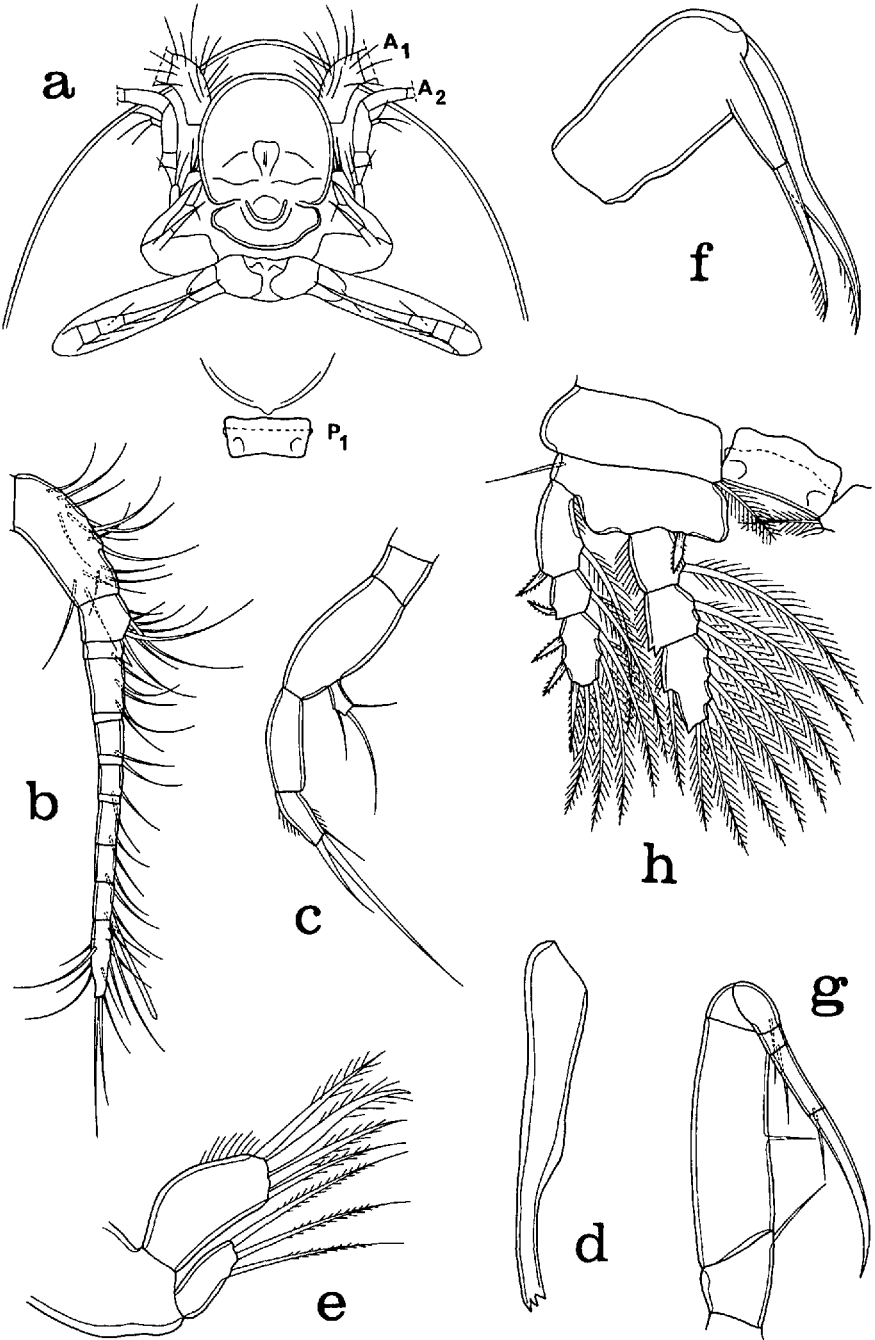


Figure 6. *Aphotopontius atlanteus*, new species. Female. a, cephalosome, mandibles not shown, ventral (scale B); b, antennule, anterodorsal (C); c, antenna, antero-inner (C); d, mandible, anterior (D); e, maxillule, posterior (D); f, maxilla, posterior (D); g, maxilliped, anterior (C); h, leg 1 and intercoxal plate, anterior (E). A_1 = antennule, A_2 = antenna, P_1 = leg 1.

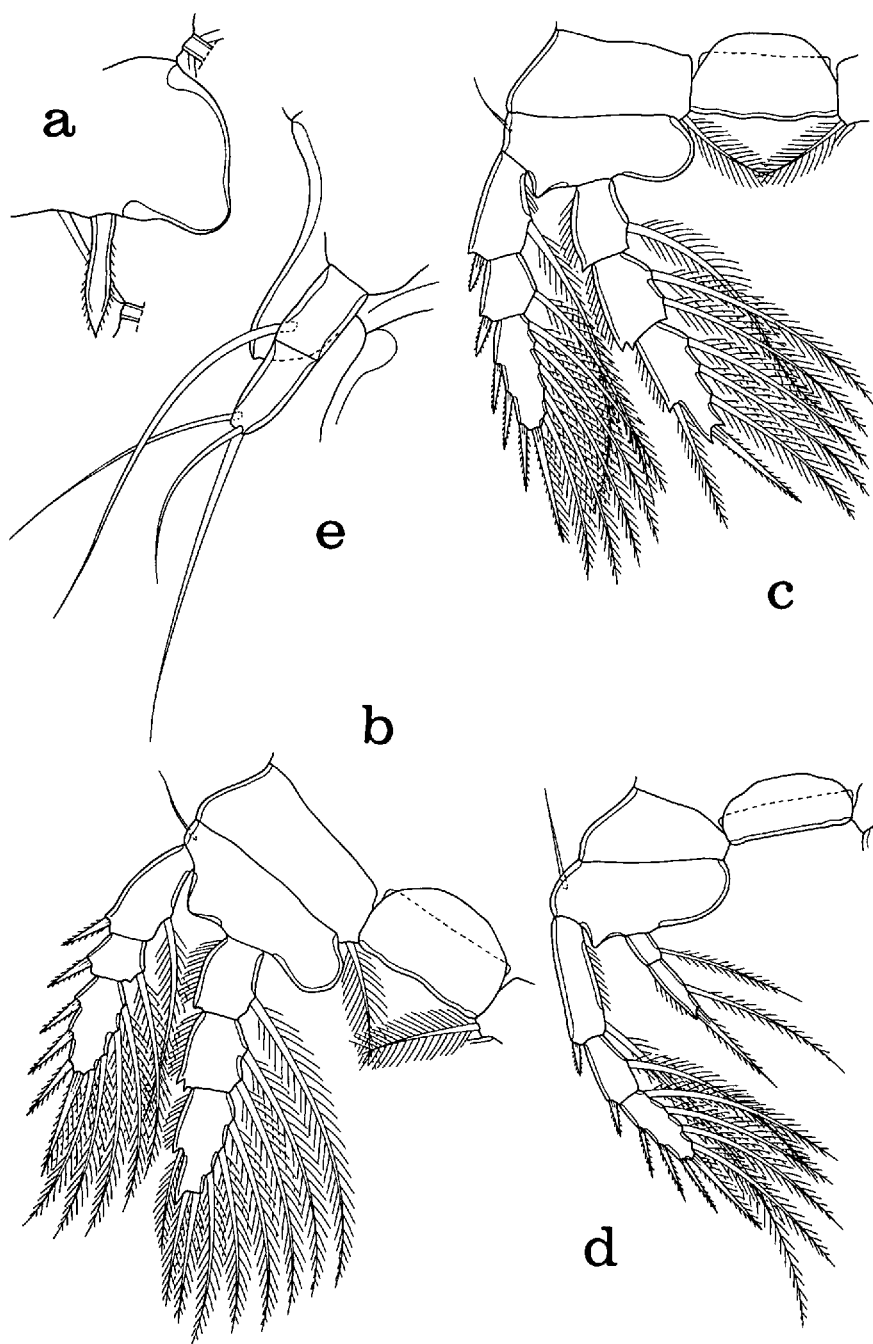


Figure 7. *Aphotopontius atlanteus*, new species. Female. a, inner side of basis, anterior (scale F); b, leg 2 and intercoxal plate, anterior (E); c, leg 3 and intercoxal plate, anterior (E); d, leg 4 and intercoxal plate, anterior (E); e, leg 5, ventral (D).

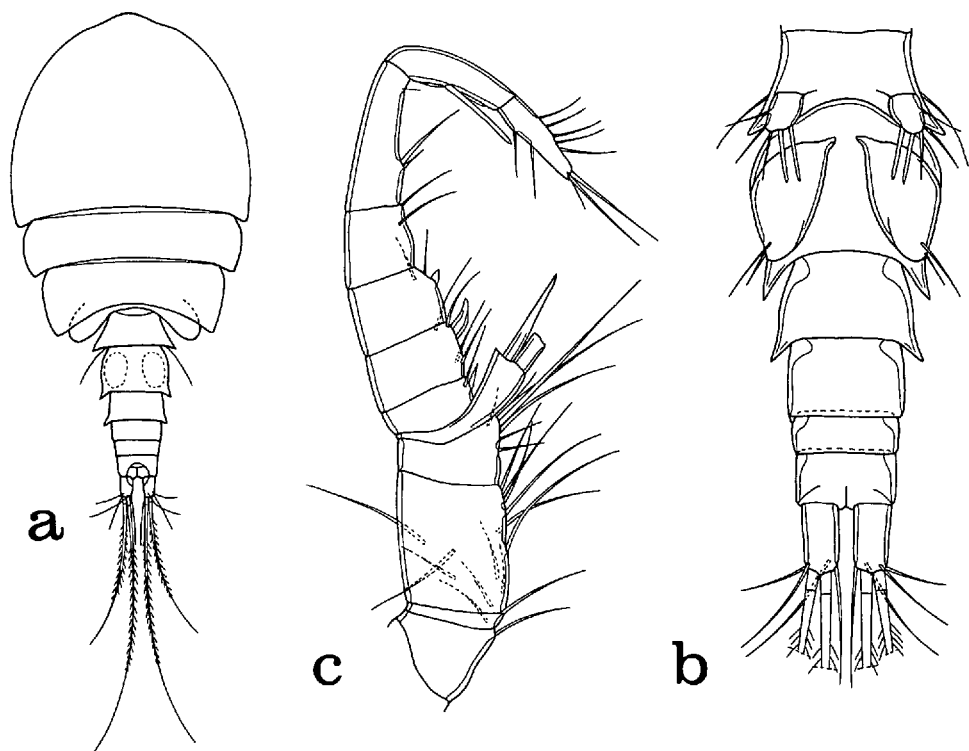


Figure 8. *Aphotopontius atlanteus*, new species. Male. a, dorsal (scale A); b, urosome, ventral (C); c, antennule, posteroventral (D).

Other Specimens.—9 ♀♀, ATLANTIS/ALVIN dive 2604, Statue of Liberty site, 37°17.59'N, 32°16.49'W, in 1,635 m, 30 May 1993 (Charles Langmuir collector).

Female.—Body (Fig. 5a) with broad prosome and relatively short urosome. Length 0.98 mm (0.88–1.08 mm), greatest width 0.51 mm (0.48–0.52 mm), based on 10 specimens. Greatest dorsoventral thickness 0.36 mm. Somite bearing first pair of legs fused with cephalosoma. Epimera of somites bearing legs 1–3 slightly rounded posteriorly. Lateral margin of somite bearing leg 3 slightly truncate. Somite bearing leg 4 short, partly covered dorsally by tergum of somite of leg 3 and with rounded epimera. Ratio of length to width of prosome 1.19:1. Ratio of length of prosome to that of urosome 2.03:1.

Somite bearing leg 5 (Fig. 5b) $75 \times 159 \mu\text{m}$, protruding ventrally (Fig. 5c). Genital double-somite in dorsal view (Fig. 5b, d) expanded in anterior half with rounded margins, but abruptly narrowed in posterior half, with small spiniform processes at posterolateral corners. Length of genital double-somite $127 \mu\text{m}$ including spiniform processes; width in anterior half $143 \mu\text{m}$, in posterior half $100 \mu\text{m}$. Genital areas located dorsolaterally in expanded anterior half of double-somite, bearing 2 minute unequal setae (Fig. 5b, c). Three postgenital somites from anterior to posterior 52×85 , 39×75 , and $42 \times 70 \mu\text{m}$.

Caudal ramus (Fig. 5e) moderately elongate, $56 \times 29 \mu\text{m}$, ratio of length to width 1.93:1. Outer lateral seta $104 \mu\text{m}$, dorsal seta $100 \mu\text{m}$, outermost terminal seta $62 \mu\text{m}$, innermost terminal seta $109 \mu\text{m}$, and 2 median terminal setae $286 \mu\text{m}$ (outer) and $495 \mu\text{m}$ (inner). All setae with lateral setules, those on 4 short setae very delicate.

Body surface without visible sensilla.

Egg sac (Fig. 5f) $350 \times 210 \mu\text{m}$, containing 2 eggs.

Rostral area not developed (Fig. 6a). Antennule (Fig. 6b) $340 \mu\text{m}$ long, 10-segmented. Terminal segment showing slight evidence of subdivision. Lengths of segments: 65 ($104 \mu\text{m}$ along anterior margin), 26, 13, 39, 29, 26, 26, 24, 24, and $44 \mu\text{m}$, respectively. Armature: 15, 8, 2, 4, 2, 2, 2, 2 + 1 aesthete, and 12. All setae smooth. Antenna (Fig. 6c) $130 \mu\text{m}$ long. Exopod $20 \times 6.5 \mu\text{m}$.

Oral cone (siphon) oval (Fig. 6a). Mandible (Fig. 6d) slender blade narrowed distally with 3 terminal teeth. Maxillule (Fig. 6e), maxilla (Fig. 6f), and maxilliped (Fig. 6g) similar to those of congeners. Postoral area (Fig. 6a) slightly protruding ventrally.

Legs 1–4 (Figs. 6h, 7b–d) biramous with 3-segmented rami except 2-segmented endopod in leg 4. Formula for armature as follows:

P_1	coxa 0-1	basis 1-I	exp I-1; enp 0-1;	I-1; 0-2;	II,I,4 1,2,3
P_2	coxa 0-1	basis 1-0	exp I-1; enp 0-1;	I-1; 0-2;	III,I,4 1,2,3
P_3	coxa 0-1	basis 1-0	exp I-1; enp 0-1;	I-1; 0-2;	III,I,5 1,I,3
P_4	coxa 0-0	basis 1-0	exp I-1; enp 0-1;	I-1; I,1	III,I,4

Leg 1 with basis having inner barbed spine $26 \mu\text{m}$, slightly swollen in distal half (Fig. 7a). Leg 4 with exopod $177 \mu\text{m}$ long. Endopod with first segment $26 \times 17 \mu\text{m}$, its inner distal seta $100 \mu\text{m}$; second segment $47 \times 15 \mu\text{m}$, its terminal setiform spine $77 \mu\text{m}$, its subterminal inner seta $125 \mu\text{m}$, and outer margin of segment with fine setules.

Leg 5 (Fig. 7e) 2-segmented, situated ventrally. First segment $30 \times 17 \mu\text{m}$, its seta $120 \mu\text{m}$; second segment $30 \times 13 \mu\text{m}$, its 3 terminal setae 96, 52, and $100 \mu\text{m}$. All setae smooth.

Leg 6 probably represented by setae on genital area (Fig. 5b, c).

Color of living specimens unknown.

Male.—Body (Fig. 8a) resembling female in general form but smaller. Length 0.53 mm , greatest width 0.30 mm , based on 1 specimen. Greatest dorsoventral thickness 0.17 mm . Ratio of length to width of prosome 1.25:1. Ratio of length of prosome to that of urosome 1.58:1.

Genital somite (Fig. 8b) $62 \mu\text{m}$ long in midline, $73 \mu\text{m}$ long including prominent posterolateral spiniform processes, $81 \mu\text{m}$ wide. First postgenital somite $39 \mu\text{m}$ long in midline, $47 \mu\text{m}$ long including posterolateral spiniform processes, and $61 \mu\text{m}$ wide. Remaining 3 postgenital somites from anterior to posterior 31×56 , 21×50 , and $25 \times 47 \mu\text{m}$.

Caudal ramus (Fig. 8b) like that of female but smaller, $26 \times 18 \mu\text{m}$, ratio 1.44:1.

Rostral area as in female. Antennule (Fig. 8c) 12-segmented, with armature 1, 2, 12, 7, 2, 2, 4, 2, 2, 3, 1 aesthete, and 10, respectively. Segment 5 with large inner process bearing spine $11 \mu\text{m}$ and adjacent truncate spine $4 \mu\text{m}$. Segment 6 with small weak spine, segment 7 with prominent recurved spiniform process, and segment 8 with minute spiniform process.

Antenna, siphon, and mouthparts as in female.

Legs 1–4 similar to those of female, except endopod of leg 2 with third segment armed with 1,II,3.

Leg 5 (Fig. 8c) located ventrally, armed as in congeners.

Leg 6 posteroventral flap on genital somite bearing 2 small setae (Fig. 8c).

Spermatophore not seen.

Color unknown.

Etymology.—The specific name *atlanteus*, Latin meaning Atlantic, refers to the presence of this species in the Atlantic Ocean.

Remarks.—*Aphotopontius atlanteus*, along with *Aphotopontius forcipatus* Humes, 1987, mentioned below, are the first members of the genus to be found in the Atlantic Ocean. All eight previously known congeners occur at deep-sea hydrothermal vent areas in the eastern Pacific north of the equator (Galapagos Rift, East Pacific Rise, Guaymas Basin, Explorer Ridge, Juan de Fuca Ridge, Gorda Ridge) (Humes, 1987, 1989, 1990a; Humes and Huys, 1992).

The new species may be distinguished from its eight congeners as follows. In five congeners the female caudal ramus has a length to width ratio greater than 4:1 [*A. arcuatus*, *A. baculigerus*, *A. flexispina*, *A. forcipatus*, and *A. limatulus*, all described by Humes (1987)], thus differing markedly from *A. atlanteus*. In *A. hydronauticus* Humes, 1989, *A. probolus* Humes, 1990, and *A. acanthinus* Humes and Lutz, 1994, the laterally expanded anterior half of the female genital double-somite ends in a pointed process, rather than being rounded as in the new species. *Aphotopontius atlanteus* is close to *A. mammillatus* Humes, 1987, but the latter shows several features by which it may be distinguished from the new species; the prosome of the female is not as broad (ratio 1.39:1), the female genital double-somite is more sharply indented laterally, the female caudal ramus has a ratio of 2.1:1, the tergum of the somite bearing leg 4 is slightly indented along its posterolateral margin rather than being smoothly rounded, and the inner margin of the basis of leg 1 is mammilliform rather than rounded.

Aphotopontius forcipatus Humes, 1987

Specimens Studied (all from Mid-Atlantic Ridge, 23°23'N, 44°56'W, Snake Pit site).—9 ♀♀, 2 ♂♂, from washings of the shrimp *Rimicaris*, MAR 93 dive M11-2619, in approximately 3,500 m, 20 June 1993; 1 ♀, MAR 93 dive M07-2617, in 3,500 m, 18 June 1993; 1 ♂, MAR 93 dive M07-2615, in 3,500 m, 16 June 1993.

Remarks.—This species has been known previously only from the Juan de Fuca, Explorer, and Gorda Ridges, northeastern Pacific (Humes, 1987, 1990; Humes and Huys, 1992).

Stygiopontius Humes, 1987

Stygiopontius cladarus new species

Figures 9a–g, 10a–i, 11a–j

Type Material.—1,505 ♀♀, 1,143 ♂♂, from washings of the shrimp *Rimicaris*, Mid-Atlantic Ridge, MAR 93 dive M11-2619, 23°23'N, 44°56'W, in approximately 3,500 m, 20 June 1993. Holotype ♀ (USNM 268309), allotype ♂ (USNM 268310), and 1,500 paratypes (780 ♀♀, 720 ♂♂) (USNM 268311) deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D.C. 1,100 paratypes (700 ♀♀, 400 ♂♂) in the Muséum National d'Histoire Naturelle, Paris. Remaining paratypes (4 ♀♀, 2 ♂♂ dissected, 20 ♀♀, 20 ♂♂ entire) in the collection of the author.

Other Specimens (all from Mid-Atlantic Ridge, 23°23'N, 44°56'W, Snake Pit site).—1 ♂, MAR 93 dive M12-2620, in 3,500 m, 23 June 1993; 42 ♀♀, 10 ♂♂, MAR 93 dive M14-2622, in 3,500 m, 23 June 1993; 9 ♀♀, 2 ♂♂, MAR 93 dive M11-2619, in approximately 3,500 m, 20 June 1993; 1 ♂, MAR 93 dive M12-2620, in 3,500 m, 21 June 1993; 34 ♀♀, 19 ♂♂, MAR 93 dive M08-2616, in 3,500 m, 17 June 1993.

Female.—Body (Fig. 9a) with moderately broad flattened prosome. Length 0.75

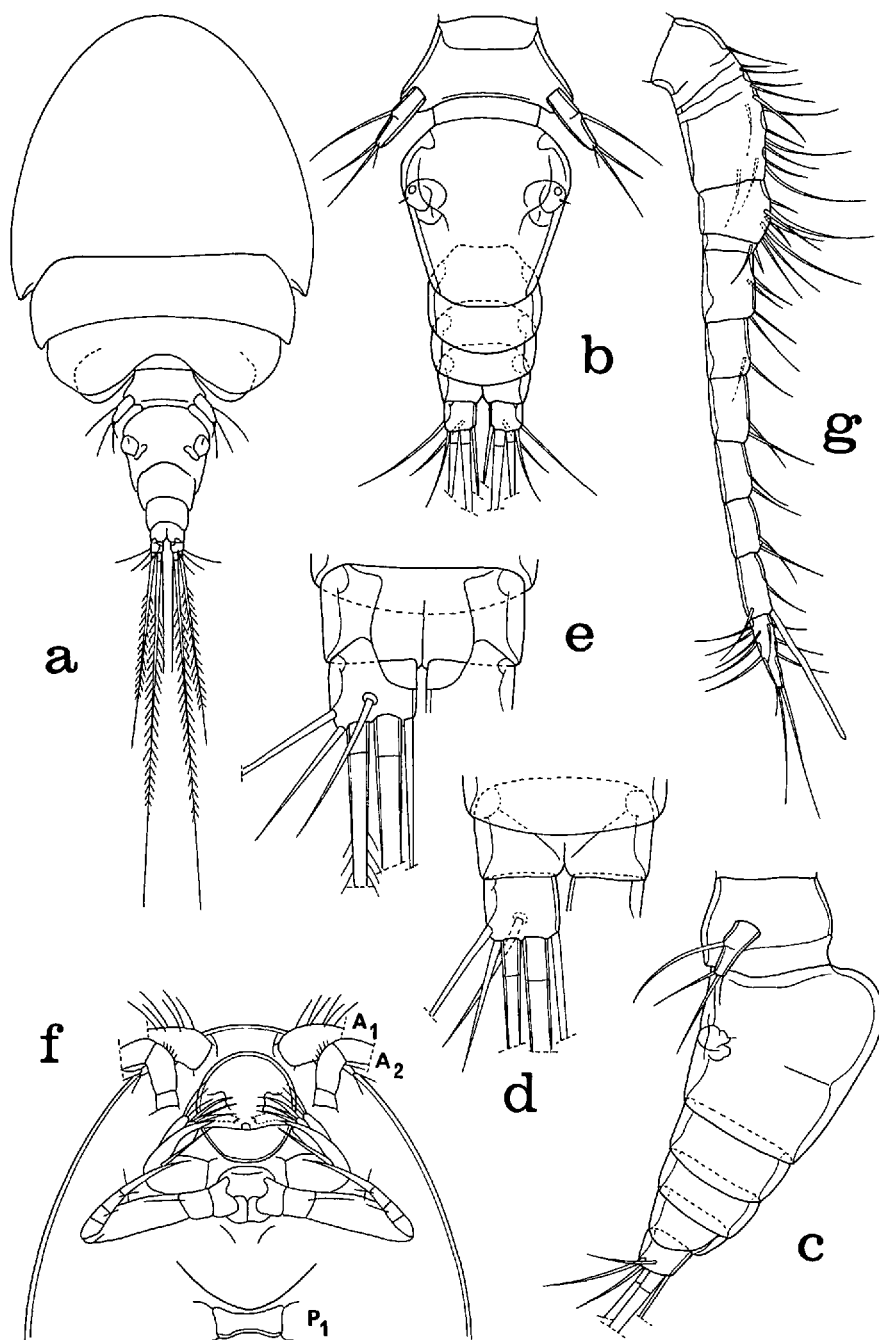


Figure 9. *Stygiopontius cladarus*, new species. Female. a, dorsal (scale A); b, urosome, ventral (E); c, urosome, lateral (E); d, anal somite and caudal ramus, dorsal (D); e, anal somite and caudal ramus, ventral (D); f, cephalosome, tips of mandibles shown by broken lines, ventral (B); g, antennule, anterodorsal (C). A₁ = antennule, A₂ = antenna, P₁ = leg 1.

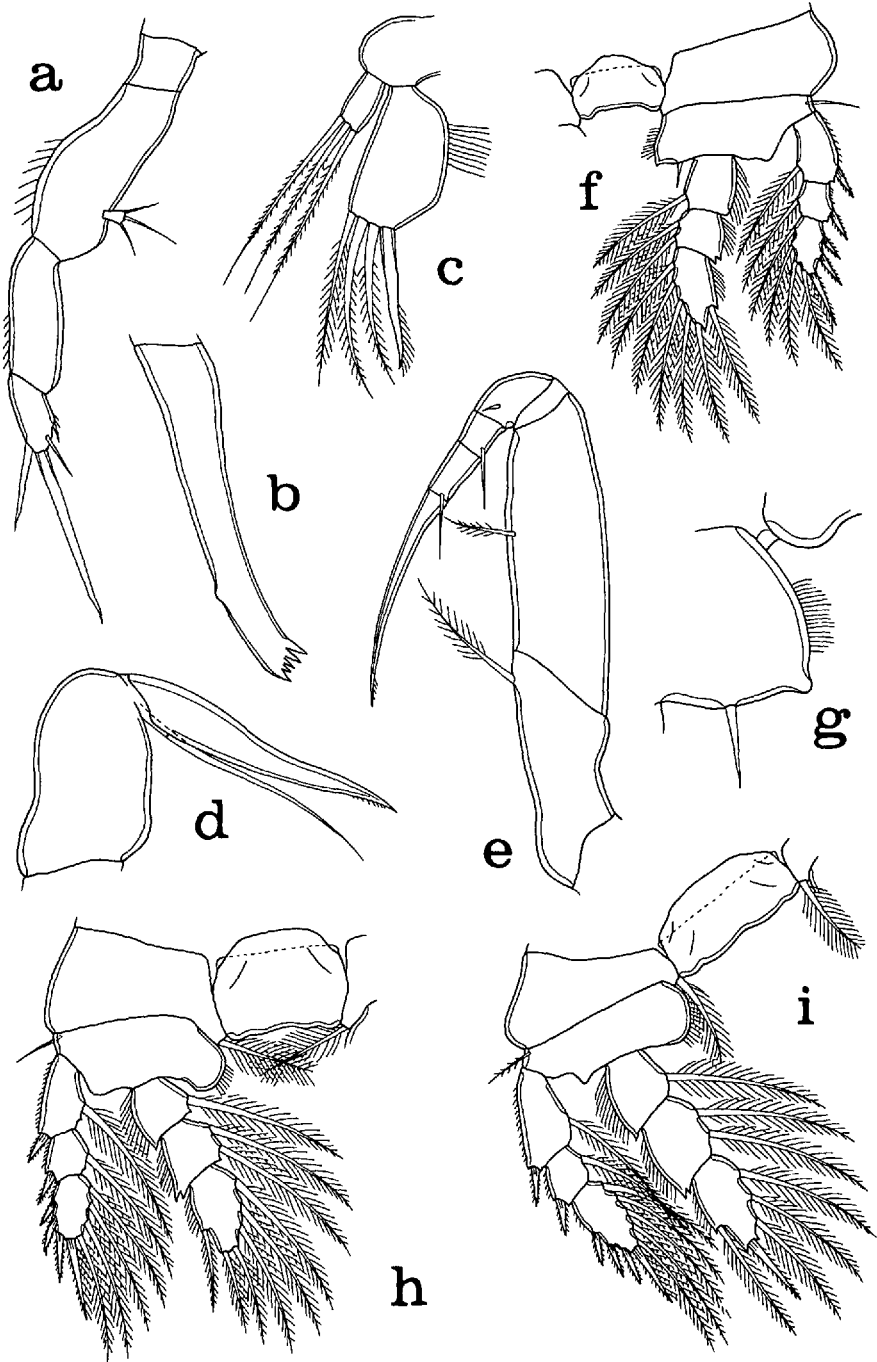


Figure 10. *Stygiopontius cladarus*, new species. Female. a, antenna, antero-inner (scale D); b, mandible, posterior (F); c, maxillule, posterior (D); d, maxilla, anterior (D); e, maxilliped, posterior (D); f, leg 1 and intercoxal plate, anterior (E); g, inner side of basis, anterior (F); h, leg 2 and intercoxal plate, anterior (E); i, leg 3 and intercoxal plate, posterior (E).

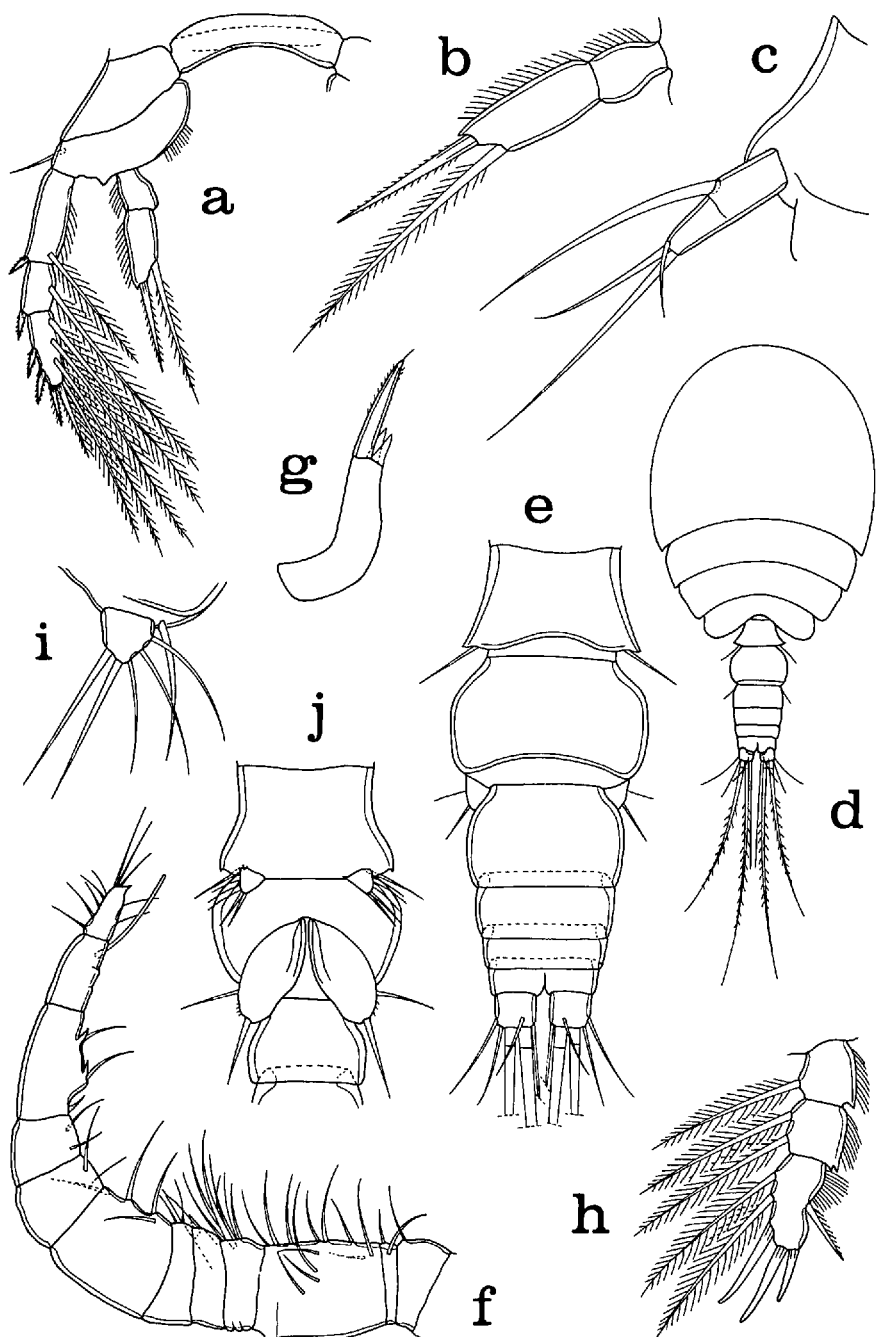


Figure 11. *Stygiopontius cladarus*, new species. Female. a, leg 4 and intercoxal plate, anterior (scale E); b, endopod of leg 4, anterior (D); c, leg 5, ventral (D). Male. d, dorsal (A); e, urosome, dorsal (C); f, antennule, anterodorsal (D); g, segment 5 of antennule, posteroventral (F); h, endopod of leg 2, anterior (C); i, leg 5, ventral (F); j, somite bearing leg 5, genital somite, and first postgenital somite, ventral (C).

mm (0.68–0.84 mm), greatest width 0.43 mm (0.40–0.47 mm), based on 20 specimens. Greatest dorsoventral thickness 0.26 mm. Epimera of somite bearing leg 1 (fused with cephalosome) pointed, those of somite bearing leg 2 less pointed, and those of somites bearing legs 3 and 4 broadly rounded. Ratio of length to width of prosome 1.79:1. Ratio of length of prosome to that of urosome 1.95:1.

Somite bearing leg 5 (Fig. 9b) $70 \times 126 \mu\text{m}$. Genital double-somite in dorsal view $135 \times 127 \mu\text{m}$, slightly longer than wide, ratio 1.06:1, widest in anterior half with rounded margins, tapered posteriorly. In lateral view genital double-somite swollen ventrally in anterior part (Fig. 9c). Genital areas located dorsolaterally just anterior to midlength of somite. Each area bearing 1 small seta (Fig. 9b). Three postgenital somites from anterior to posterior 60×83 , 49×70 , and $34 \times 59 \mu\text{m}$.

Caudal ramus quadrate in ventral view (Fig. 9d), $24 \times 24 \mu\text{m}$; in dorsal view (Fig. 9e) projected forward, with greatest length $30 \mu\text{m}$. Outer lateral seta $105 \mu\text{m}$, dorsal seta $70 \mu\text{m}$, outermost terminal seta $68 \mu\text{m}$, and innermost terminal seta $200 \mu\text{m}$, all smooth. Two terminal setae $286 \mu\text{m}$ (outer) and $528 \mu\text{m}$ (inner), both with lateral setules.

Body surface without visible sensilla.

Egg sac not seen.

Rostrum not developed (Fig. 9f). Antennule (Fig. 9g) $290 \mu\text{m}$ long. Length of its 12 segments: 16 ($31 \mu\text{m}$ along anterior margin), 5, 34, 21, 8, 31, 27, 26, 26, 26, 27, and $29 \mu\text{m}$, respectively. Armature: 1, 2, 12, 8, 2, 4, 2, 2, 2, 2, 2 + 1 aesthete, and 12. All setae smooth. Antenna (Fig. 10a) $135 \mu\text{m}$ long, 4-segmented. Coxa short, unornamented. Basis elongate with row of prominent setules along inner edge. Exopod minute, $8 \times 3.5 \mu\text{m}$, bearing 3 setae. Endopod 2-segmented, long first segment with small inner marginal setules, short second segment bearing 4 setae, longest $76 \mu\text{m}$.

Oral cone (siphon) (Fig. 9f) oval. Mandible (Fig. 10b) slender blade $122 \mu\text{m}$ long with few small terminal teeth. Maxillule (Fig. 10c) with small slender outer lobe bearing 3 slender setae, large inner lobe with 4 setae, one stouter than others, and ornamented with row of conspicuous long setules on proximal inner margin. Maxilla (Fig. 10d) with first segment bearing 1 long seta; second segment slightly sinuous, clawlike, with few minute distal setules. Maxilliped (Fig. 11e) 5-segmented. First and second segments with 1 plumose inner seta. Third, fourth, and fifth segments with 1 slender seta. Claw $73 \mu\text{m}$, with few small distal spinules. Arrangement of appendages on cephalosome and postoral area as in Fig. 9f.

Legs 1–4 (Figs. 10f, h, i, 11a) biramous, with 3-segmented rami except 2-segmented endopod in leg 4. Spine and setal formula as follows:

P_1	coxa 0-0	basis 1-I	exp I-1; enp 0-1;	I-1; 0-2;	II,I,4 1,5
P_2	coxa 0-1	basis 1-0	exp I-1; enp 0-1;	I-1; 0-2;	III,I,4 1,2,3
P_3	coxa 0-1	basis 1-0	exp I-1; enp 0-1;	I-1; 0-2;	III,I,5 1,I,3
P_4	coxa 0-0	basis 1-0	exp I-1; enp 0-0;	I-1; I,1	III,I,4

Inner seta on coxa present in legs 2 and 3, but absent in legs 1 and 4. Leg 1 with slender inner spine on basis $24 \mu\text{m}$ long; inner margin of basis mammilliform in outline (Fig. 10g). Outer margins of exopodal segments in legs 1–3 with small spinules.

Leg 4 with exopod $146 \mu\text{m}$ long. Endopod (Fig. 11b) with first segment $23 \times$

18 μm ; second segment $49 \times 21 \mu\text{m}$, bearing minutely barbed terminal spine 52 μm and subterminal inner plumose seta 99 μm .

Leg 5 (Fig. 11c) $49 \times 14 \mu\text{m}$, its 2 segments separated by incomplete suture. Seta on first segment 94 μm . Three terminal setae on second segment 90, 52, and 20 μm .

Leg 6 represented by seta on genital area (Fig. 9b).

Color unknown.

Male.—Body (Fig. 11d) with broad prosome as in female. Length 0.55 mm (0.52–0.57 mm), greatest width 0.32 mm (0.31–0.32 mm), based on 10 specimens. Ratio of length to width of prosome 1.23:1. Ratio of length of prosome to that of urosome 1.96:1.

Somite bearing leg 5 (Fig. 11e) $39 \times 78 \mu\text{m}$. Genital somite $60 \times 90 \mu\text{m}$, wider than long, ratio 0.67:1. Four postgenital segments 39×73 , 34×63 , 23×56 , and $21 \times 52 \mu\text{m}$.

Caudal ramus (Fig. 11e) $18 \times 20 \mu\text{m}$, in dorsal view slightly wider than long, ratio 0.9:1, resembling that of female.

Body surface smooth as in female.

Rostral area like that of female. Antennule (Fig. 11f) 12-segmented, geniculate. Lengths of its segments: 8 (27 μm along anterior margin), 5.5, 42, 9, 9, 11, 31, 25, 25, 39, 30, and 17 μm , respectively. Armature: 1, 2, 12, 7, 2, 2, 4, 2, 2, 3, 1 aesthete, and 10. Fifth segment with stout spinelike seta with lateral barbules and terminal filament and 1 small spine and spiniform process (Fig. 11f). Segment 10 with 2 small spinelike processes in addition to 3 setae. Segment 12 with minute terminal hook. All setae smooth.

Antenna, siphon, mandible, maxillule, maxilla, maxilliped, and postoral area as in female.

Legs 1–4 similar to those of female, except sexual dimorphism in third segment of endopod of leg 2 (Fig. 11h), with formula 1,II,I,2 and inner margin indented with row of coarse long setules proximal to seta. Inner coxal seta absent in legs 1–4.

Leg 5 (Fig. 11i) situated ventrally (Fig. 11j) with minute free segment $9 \times 11 \mu\text{m}$, bearing 2 inner hyaline setae and 3 more slender setae. All setae smooth, including adjacent dorsal seta.

Leg 6 (Fig. 11j) posteroventral flap on genital somite bearing 2 smooth setae 29 μm and 26 μm , and few minute outer marginal spinules.

Spermatophore spherical, $28 \times 29 \mu\text{m}$.

Color unknown.

Etymology.—The name is derived from the Greek word *kladaros*, meaning easily broken, referring to the often broken antennules and setae on the caudal rami among the hundreds of specimens observed of both sexes.

Remarks.—The subquadrate caudal ramus in *Stygiopontius cladarus* is characteristic; in all congeners the caudal ramus is at least 1.5:1. The absence of spiniform processes on the genital double-somite of the female also distinguishes the new species from all but three congeners. These may be separated from *S. cladarus* on the basis of the following characters. In *Stygiopontius lumiger* Humes, 1989, the first postgenital somite has a pair of spiniform processes and the ratio of the caudal ramus is 2.38:1. In *Stygiopontius cinctiger* Humes, 1987, the posterior half of the broad genital double-somite has a band of light brown color on the ventral surface, the second postgenital somite is unusually short, and the body length is 1.00 mm

(0.94–1.08 mm). In *Stygiopontius brevispina* Humes, 1991, the caudal ramus is 2.72:1 and the genital double-somite is incised medially.

It is more difficult to compare the male of *S. cladarus* with congeners, since in several species males are unknown. However, features of the new species that appear to be characteristic are the nature of the sexual dimorphism in the endopod of leg 2 and the abbreviated caudal ramus.

Stygiopontius serratus new species

Figures 12a–i, 13a–i, 14a–f

Type Material.—125 ♀♀, 591 ♂♂, Mid-Atlantic Ridge, MAR 93 dive M11-2619, 23°23'N, 44°56'W, Snake Pit site, in approximately 3,500 m, 20 June 1993. Holotype ♀ (USNM 268312), allotype ♂ (USNM 268313), and 625 paratypes (100 ♀♀, 525 ♂♂) (USNM 268314) deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D.C. Remaining paratypes (5 ♀♀, 3 ♂♂ dissected, 19 ♀♀, 62 ♂♂ entire) in the collection of the author.

Other Specimens (all from Mid-Atlantic Ridge, 23°23'N, 44°56'W, Snake Pit site).—1♂, MAR 93 dive M12-2630, Snake Pit, in 3,500 m, 21 June 1993; 1♂, MAR 93 dive M11-2619, in approximately 3,500 m, 20 June 1993; 10 ♂♂, MAR 93 dive M08-2616, in 3,500 m, 17 June 1993.

Female.—Body (Fig. 12a) with prosome more rounded anteriorly than in *S. cladarus*, with anterior end projecting slightly forward. Length 0.76 mm (0.69–0.80 mm), greatest width 0.32 mm (0.29–0.32 mm), based on 10 specimens. Greatest dorsoventral thickness 0.30 mm. Epimera of metasomal somites rounded, especially in more posterior somites. Ratio of length to width of prosome 1.26:1. Ratio of length of prosome to that of urosome 1.26:1.

Somite bearing leg 5 (Fig. 12b) 70 × 120 μm. Genital double-somite in dorsal view 112 μm long, 120 μm wide, 99 μm wide posteriorly with subparallel sides. Both anterior and posterior sections with posterolateral spiniform processes. Genital double-somite (Fig. 12c) not produced ventrally as in *S. cladarus*. Genital areas located at level of anterior pair of spiniform processes. Each area bearing seta approximately 15 μm. Three postgenital somites from anterior to posterior 57 × 81, 42 × 70, and 36 × 65 μm.

Caudal ramus (Fig. 12d) moderately elongate, 55 × 26 μm, ratio 2.12:1. Outer lateral seta 39 μm, dorsal seta 55 μm, outermost terminal seta 34 μm, and innermost terminal seta 52 μm, all smooth; two terminal setae 230 μm (outer) and 430 μm (inner), both with delicate lateral setules.

Body surface smooth without visible sensilla.

Egg sac not seen.

Rostrum weakly developed (Fig. 12e). Antennule (Fig. 12g) 225 μm long. Lengths of its 12 segments: 13 (26 μm along anterior margin), 5, 36, 15, 8, 18, 18, 18, 18, 19, 21, and 26 μm, respectively. Armature as in *S. cladarus*. All setae smooth. Segments 5–10 with posterodistal corners produced, creating sawlike margin (Fig. 12h). Antenna (Fig. 12i) 117 μm long not including terminal spine, in general form resembling that of *S. cladarus*. Exopod minute, 8 × 4 μm. Long terminal spine 53 μm.

Oral cone (siphon) (Fig. 12f) more elongate and posteriorly more pointed than in *S. cladarus*. Mandible (Fig. 13a), maxillule (Fig. 12b), maxilla (Fig. 12c), and maxilliped (Fig. 12d) similar to those of *S. cladarus*.

Legs 1–4 (Fig. 13e–h) segmented as in *S. cladarus*. Spine and setal formula as follows:

P ₁	coxa 0-0	basis 1-I	exp I-1;	I-1;	II,I,4
			enp 0-1;	0-2;	I,2,3

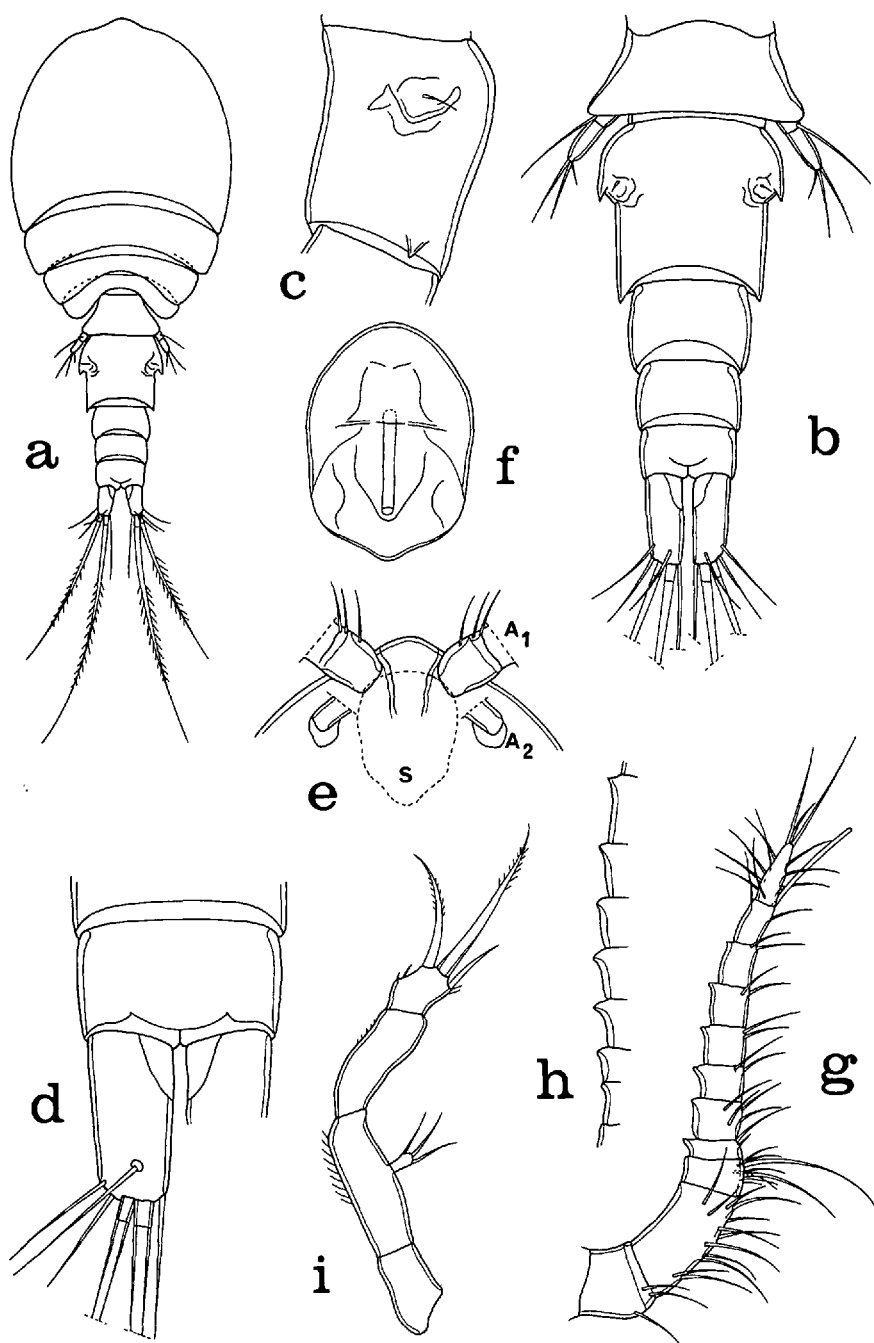


Figure 12. *Stygiopontius serratus*, new species. Female. a, dorsal (scale A); b, urosome, dorsal (E); c, genital somite, lateral (C); d, anal somite and caudal ramus, dorsal (D); e, rostral area and outline of siphon, ventral (E); f, siphon, ventral (D); g, antennule, posteroventral (C); h, posterior edge of segments 4–10 of antennule, posteroventral (D); i, antenna, anterior (D). A₁ = antennule, A₂ = antenna, S = position of siphon.

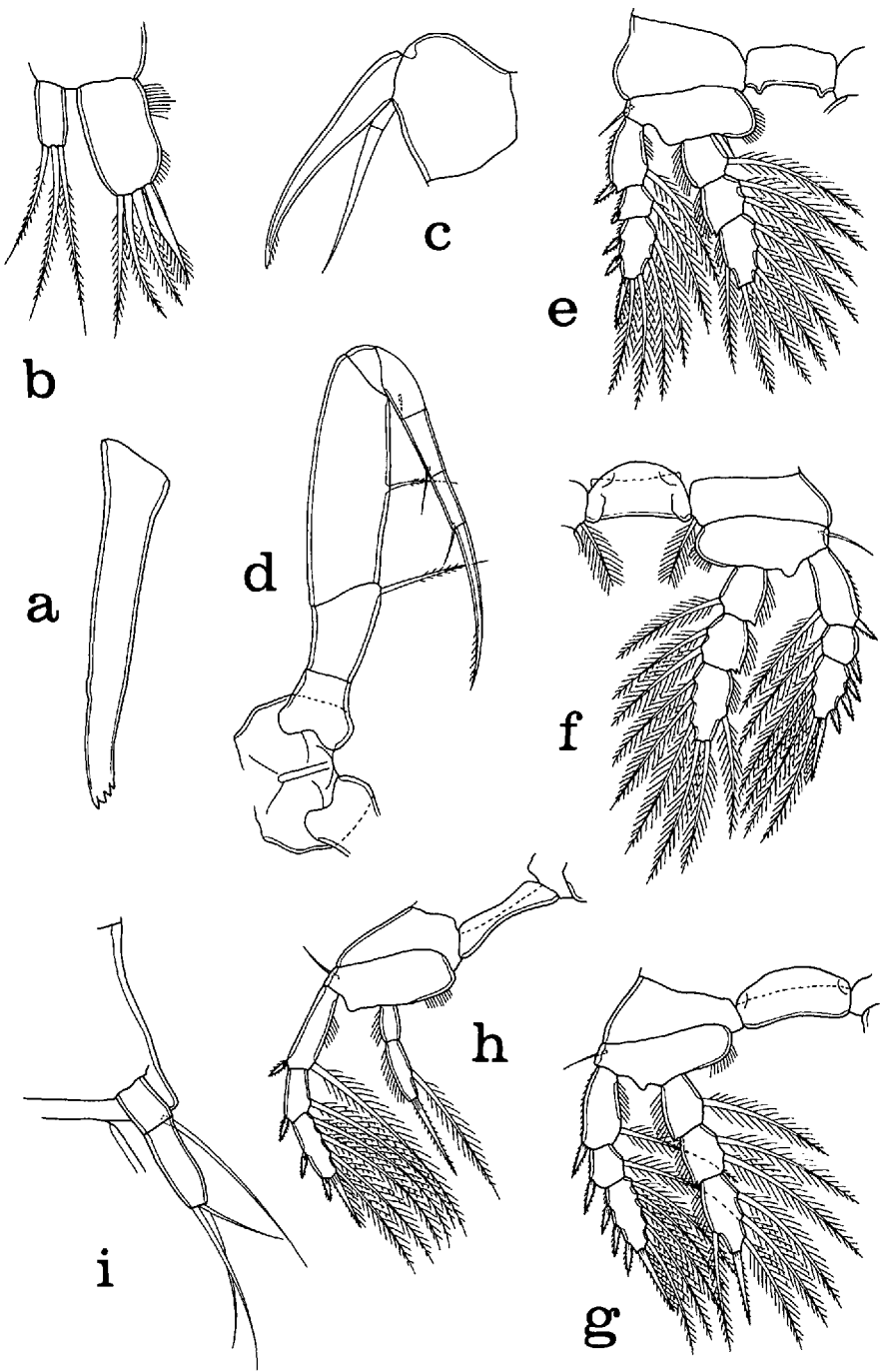


Figure 13. *Stygiopontius serratus*, new species. Female. a, mandible, anterior (scale F); b, maxillule, posterior (D); c, maxilla, anterior (D); d, maxilliped, anterior (D); e, leg 1 and intercoxal plate, anterior (D); f, leg 2 and intercoxal plate, anterior (E); g, leg 3 and intercoxal plate, anterior (E); h, leg 4 and intercoxal plate, anterior (E); i, leg 5, ventral (D).

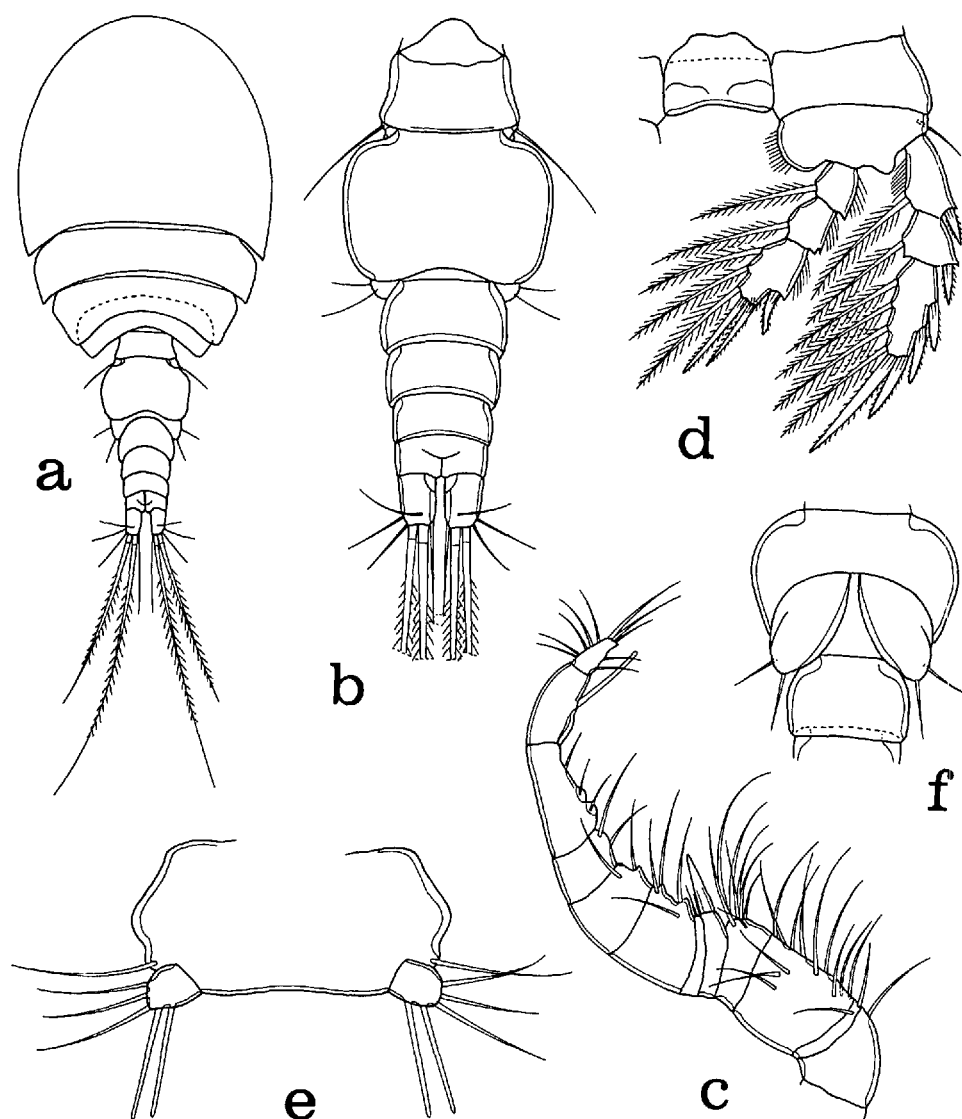


Figure 14. *Stygiopontius serratus*, new species. Male. a, dorsal (scale A); b, urosome, dorsal (E); c, antennule, anterodorsal (C); d, leg 2 and intercoxal plate, anterior (E); e, fifth pair of legs, dorsal (D); f, genital somite and first postgenital somite, ventral (E).

P ₂	coxa 0-1	basis 1-0	exp I-1; enp 0-1;	I-1; 0-2;	III,I,4 1,2,3
P ₃	coxa 0-0	basis 1-0	exp I-1; enp 0-1;	I-1; 0-2;	III,I,5 1,I,3
P ₄	coxa 0-0	basis 1-0	exp I-1; enp 0-0;	I-1; I,1	II,I,4

Leg 1 with inner spine on basis 33 μ m; outer spine on second segment of exopod distinctly shorter than other exopodal spines (Fig. 13e). Leg 4 with exopod

121 μm . Endopod with first segment $21 \times 13 \mu\text{m}$; second segment $36 \times 13 \mu\text{m}$. Terminal barbed spine 42 μm , subterminal plumose seta 55 μm .

Leg 5 (Fig. 13i) $49 \times 10 \mu\text{m}$, its 2 segments separated. Seta on first segment 65 μm ; those on second segment from outer to inner 26, 40, and 52 μm .

Leg 6 represented by seta on genital area (Fig. 12b,c).

Color unknown.

Male.—Body (Fig. 14a) with prosome resembling that of *S. cladarus*. Length 0.67 mm (0.65–0.72 mm) and greatest width 0.34 mm (0.32–0.36 mm), based on 10 specimens. Greatest dorsoventral thickness 0.22 mm. Ratio of length to width of prosome 1.26:1. Ratio of length of prosome to that of urosome 1.57:1.

Somite bearing leg 5 (Fig. 14b) $52 \times 86 \mu\text{m}$. Genital somite in dorsal view broader than long, with slight anterior shoulders and posteriorly with slightly truncate margins. Length 88 μm not including leg 6, 107 μm including leg 6, greatest width 127 μm . Four postgenital somites from anterior to posterior 36×75 , 34×65 , 23×57 , and $26 \times 55 \mu\text{m}$.

Caudal ramus resembling that of female but smaller, $34 \times 21 \mu\text{m}$, ratio 1.62:1.

Body surface smooth as in female.

Rostral area similar to that of female. Antennule (Fig. 14c) 12-segmented, geniculate. Length of its segments: 8 (24 μm along anterior margin), 2, 34, 10, 7, 9, 35, 26, 23, 47, 36, and 21 μm . Armature as in *S. cladarus*. All setae smooth. Spine on segment 5 26 μm long.

Antenna, siphon, mandible, maxillule, maxilla, maxilliped, and postoral area as in female.

Legs 1–4 segmented and armed as in female except sexual dimorphism in leg 2 (Fig. 14d) with spines on exopod stronger and formula for endopod 0–1; 0–1; I,II,3. Second segment of endopod unusual in having only 1 seta, but sclerotization of inner margin of segment interrupted, perhaps indicating location of seta now lost.

Leg 5 (Fig. 14e) situated ventrally, with minute free segment $21 \times 13 \mu\text{m}$, bearing 3 outer slender setae and 2 very hyaline broad inner setae (latter difficult to distinguish unless under high magnification and reduced illumination). All setae smooth including adjacent seta on somite.

Leg 6 (Fig. 14f) posteroventral flap on genital somite bearing 2 small setae.

Spermatophore not seen.

Color unknown.

Etymology.—The specific name is from Latin *serratus*, meaning sawlike, alluding to the appearance of the posterior margin of the antennule in the female.

Remarks.—Females of *Stygiopontius serratus* may be distinguished from all congeners by the serrate nature of the posterior margin of the antennule. Males of the new species may be recognized by the formula I,II,3 (instead of I,II,I,2 or 1 II,I,2) for the third segment of the endopod of leg 2. A somewhat comparable formula for the endopod of leg 2 is found in males of *Stygiopontius brevispina* Humes, 1991, but here it is 1,II,3. This species, found in the Lau Basin west of the Tonga Islands, is distinctly larger [length of female 1.25 mm (1.20–1.31 mm) and male 0.85 mm (0.83–0.89 mm)].

Stygiopontius teres new species

Figures 15a–d, 16a–i, 17a–d

Type Material.—12 ♀♀, Mid-Atlantic Ridge, MAR 93 dive M07-2615, 23°23'N, 44°56'W, Snake Pit site, in 3,500 m, 16 June 1993. Holotype (USNM 268315) and 9 paratypes (USNM 268316) deposited

in the National Museum of Natural History, Smithsonian Institution, Washington, D.C. Remaining paratypes (2 ♀♀ dissected) in the collection of the author.

Other Specimens (all from Mid-Atlantic Ridge, 23°23'N, 44°56'W, Snake Pit site).—4♀♀, MAR 93 dive M12-2620, in 3,500 m, 21 June 1993; 4 ♀♀, MAR 93 dive M11-2619, in 3,500 m, 20 June 1993; 1 ♀, MAR 93 dive M14-2622, in 3,500 m, 2 June 1993; 1 ♀, MAR 93 dive M09-2617, in 3,500 m, 18 June 1993.

Female.—Body (Fig. 15a) with moderately slender prosome. Length 0.90 mm (0.82–0.96 mm), greatest width 0.50 mm (0.47–0.57 mm), based on 10 specimens. Greatest dorsoventral thickness 0.42 mm. Epimera of metasomal somites 1–3 bluntly rounded, those of metasomal somite 4 pointed. Somite bearing fourth pair of legs largely covered in dorsal view by tergum of somite bearing third pair of legs. Ratio of length to width of prosome 1.27:1. Ratio of length of prosome to that of urosome 1.68:1.

Somite bearing leg 5 (Fig. 15b) $78 \times 169 \mu\text{m}$. Genital double-somite in dorsal view $148 \mu\text{m}$ long including pair of posterolateral spiniform processes, width in anterior half with rounded lateral margins $164 \mu\text{m}$, width in posterior half $132 \mu\text{m}$. Junction between anterior and posterior parts smoothly indented. Genital areas located dorsolaterally just anterior to middle of somite. Each area with 2 very small setae. One female with round spermatophores, $61 \times 57 \mu\text{m}$, attached to genital double-somite (Fig. 15c). Three postgenital somites from anterior to posterior 52×116 , 36×99 , and $42 \times 86 \mu\text{m}$.

Caudal ramus (Fig. 15d) moderately short, $52 \times 40 \mu\text{m}$, ratio 1.3:1. Outer lateral seta $40 \mu\text{m}$, dorsal seta $78 \mu\text{m}$, outermost terminal seta $65 \mu\text{m}$, innermost terminal seta $170 \mu\text{m}$, and 2 long median terminal setae $330 \mu\text{m}$ (outer) and $560 \mu\text{m}$ (inner), all plumose.

Surface of body lacking visible sensilla.

Egg sac not seen.

Rostrum (Fig. 16a) broadly rounded but weak. Antennule (Fig. 16b) $360 \mu\text{m}$ long. Length of its 10 segments: 68 ($112 \mu\text{m}$ along anterior margin), 31, 10, 36, 29, 29, 29, 27, and $40 \mu\text{m}$, respectively. Armature: 15, 8, 2, 4, 2, 2, 2, 2 + 1 aesthete, and 12. All setae smooth.

Antenna (Fig. 16c), siphon (Fig. 16a), mandible (Fig. 16d), maxillule (Fig. 16e), maxilla (Fig. 16f), and maxilliped (Fig. 16g) as illustrated, differing from congeners only in minor details.

Legs 1–4 (Figs. 16h, g, 17a, b) segmented and armed as in *S. cladarus*, but inner coxal seta present in legs 1 and 2, absent in legs 3 and 4, and third segment of exopod of leg 4 armed with II,I,4. Leg 4 (Fig. 17b) with exopod $140 \mu\text{m}$ long. Endopod (Fig. 17c) with first segment $26 \times 17 \mu\text{m}$; second segment slightly swollen, $50 \times 23 \mu\text{m}$, its inner plumose seta $104 \mu\text{m}$, its terminal barbed spine $70 \mu\text{m}$.

Leg 5 (Fig. 17d) $52 \times 39 \mu\text{m}$, ratio 1.3:1, its 2 segments almost completely fused. Ventromedial border of leg expanded and angular. Seta corresponding to first segment $130 \mu\text{m}$, finely plumose. Three terminal setae 44, 57, and $104 \mu\text{m}$, longest seta plumose.

Leg 6 represented by minute setae on genital area (Fig. 15b).

Color unknown.

Male.—Unknown.

Etymology.—The specific name *teres*, Latin meaning smooth, rounded, polished, alludes to the smoothly rounded anterior part of the genital double-somite.

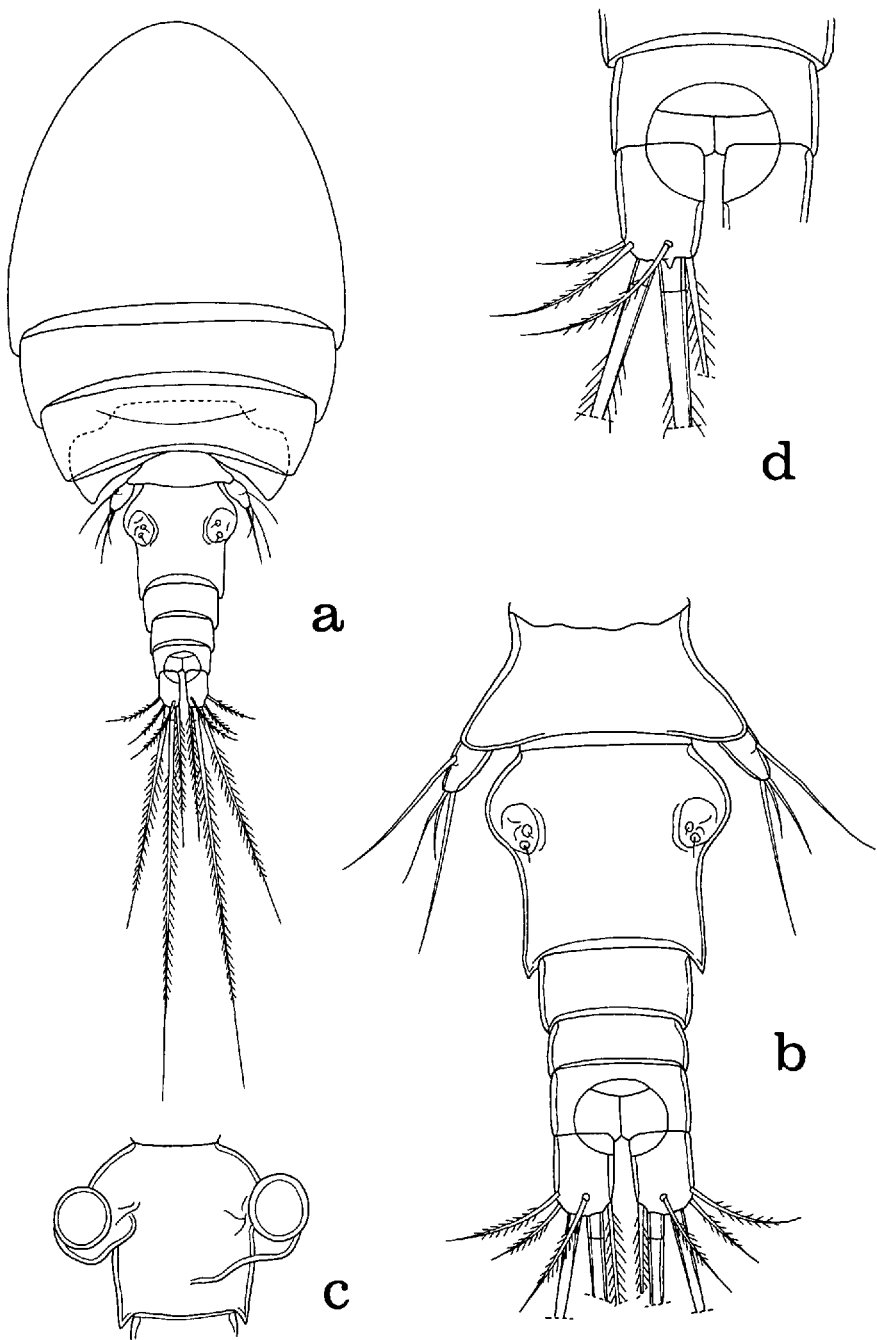


Figure 15. *Stygiopontius teres*, new species. Female. a, dorsal (scale A); b, urosome, dorsal (E); c, genital double-somite with spermatophores attached, ventral (B); d, anal somite and caudal ramus, dorsal (C).

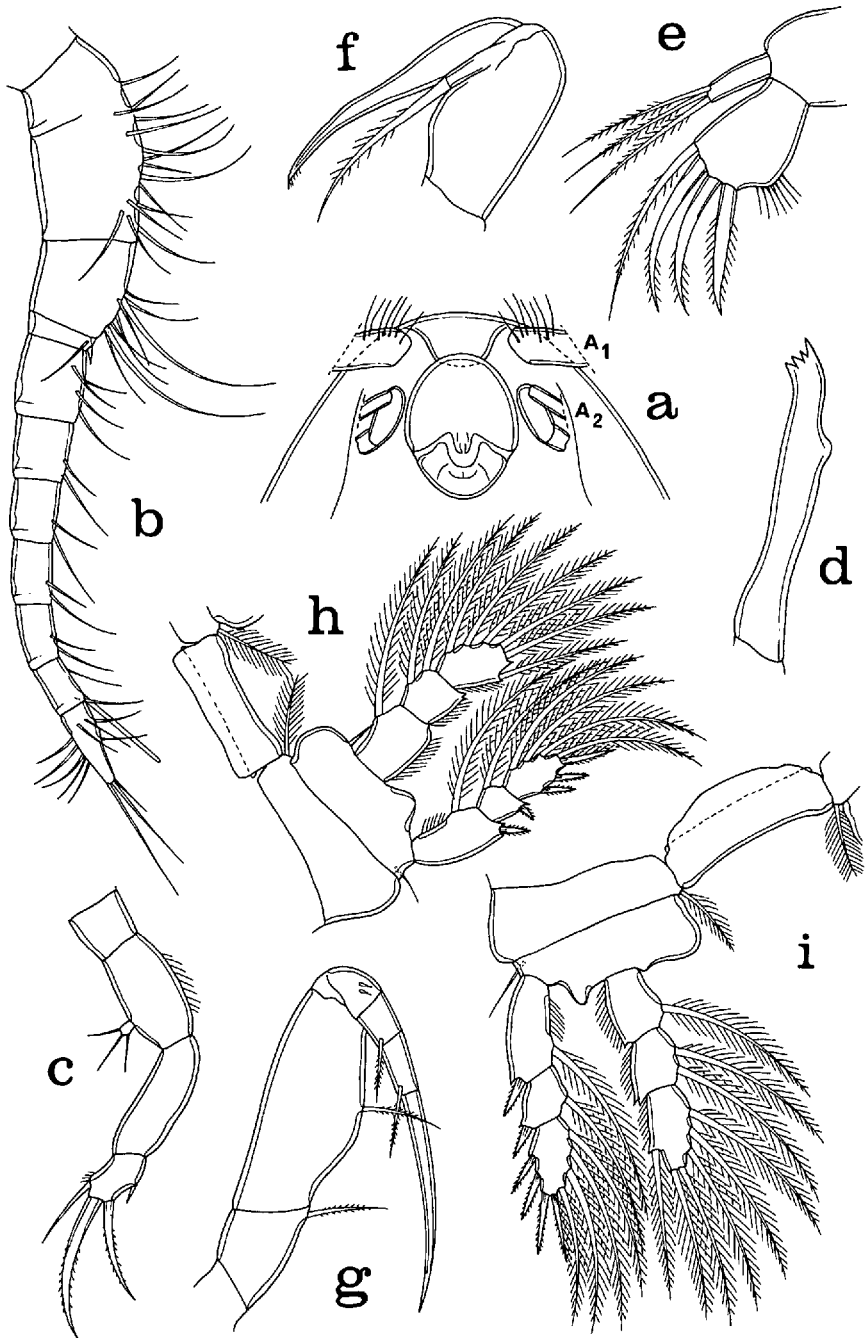


Figure 16. *Stygiopontius teres*, new species. Female. a, rostrum and siphon, ventral (scale B); b, antennule, posteroventral (C); c, antenna, anterior (C); d, mandible, anterior (C); e, maxillule, anterior (C); f, maxilla, posterior (C); g, maxilliped, posterior (C); h, leg 1 and intercoxal plate, anterior (E); i, leg 2 and intercoxal plate, anterior (E). A₁ = antennule, A₂ = antenna.

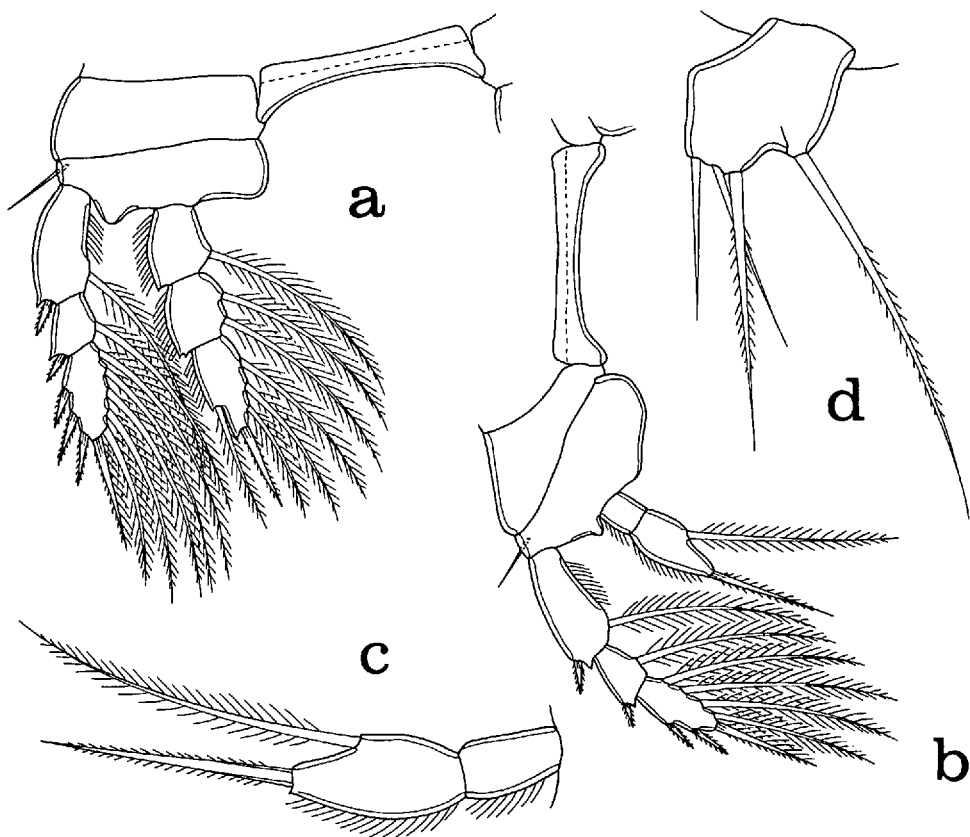


Figure 17. *Stygiopontius teres*, new species. Female. a, leg 3 and intercoxal plate, anterior (scale E); leg 4 and intercoxal plate, anterior (E); c, endopod of leg 4, anterior (F); d, leg 5, lateral (D).

Remarks.—The form of the female genital double-somite, with its smoothly rounded anterior expansions, is unlike that of any other species in the genus where females are known. The shape of leg 5, with its angular ventro-inner margin, is also distinctive.

The new species cannot be directly compared with two species of *Stygiopontius* in which only males are known. However, the spherical knob on the second segment of the maxilliped in *Stygiopontius verruculatus* Humes, 1987, and the larger body size in *Stygiopontius paxillifer* Humes, 1989, suggest the distinctness of these species.

***Stygiopontius regius* new species**

Figures 18a–h, 19a–j, 20a–i

Type Material.—9 ♀♀, 8 ♂♂, Mid-Atlantic Ridge, MAR 93 dive M08-2616, 23°23'N, 44°56'W, Snake Pit site, in 3,520 m, 17 June 1993. Holotype ♀ (USNM 268317), allotype ♂ (USNM 268318), and 12 paratypes (6 ♀♀, 6 ♂♂) (USNM 268219) deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D.C. Remaining paratypes (2 ♀♀, 1 ♂ dissected) in the collection of the author.

Other Specimens (all from Mid-Atlantic Ridge, 23°23'N, 44°56'W, Snake Pit site).—1 ♀, MAR 93 dive M11-2619, in approximately 3,500 m, 20 June 1993; 1 ♂, MAR 93 dive M14-2622, in 3,500 m, 23 June 1993.

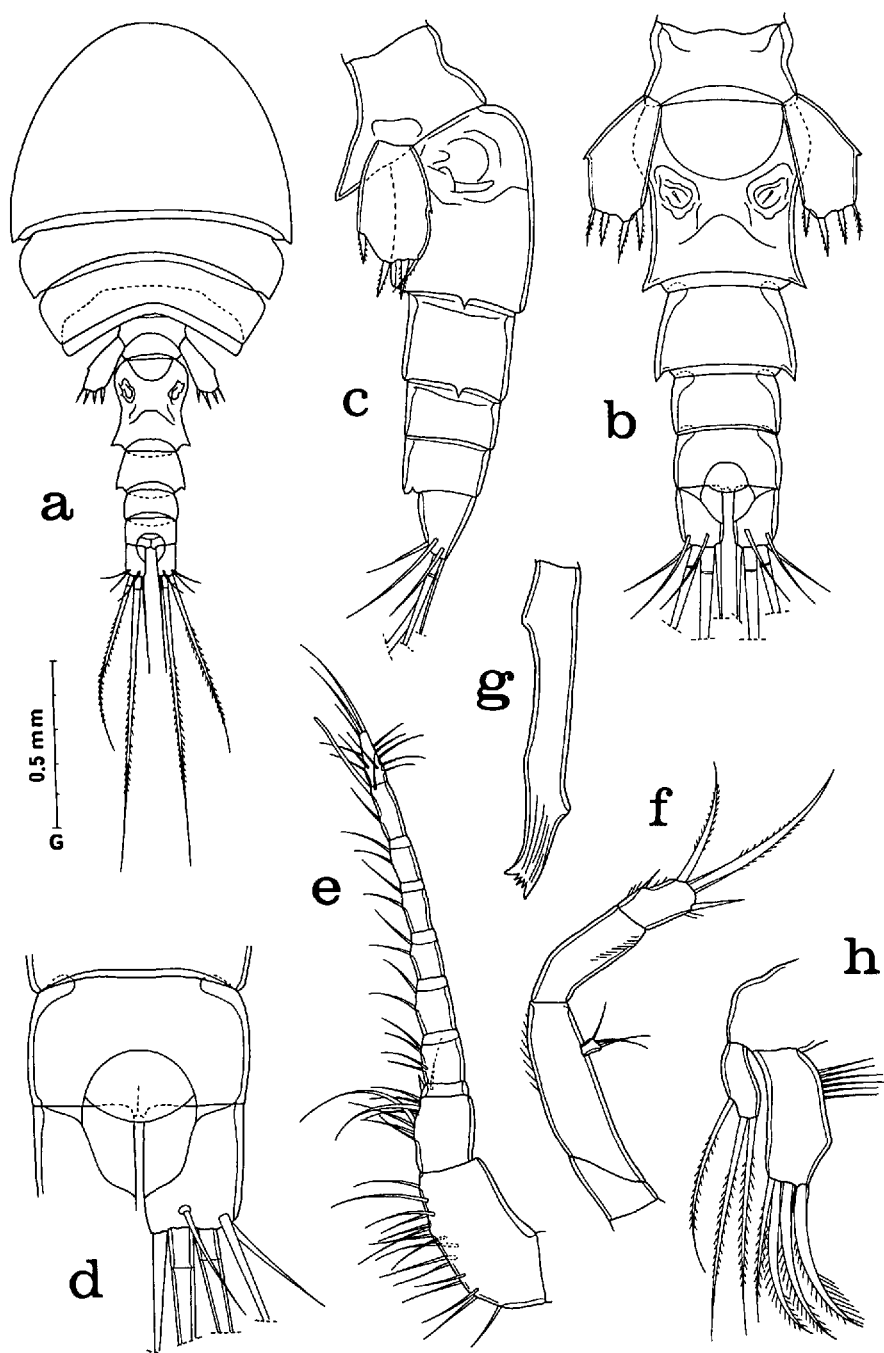


Figure 18. *Stygiopontius regius*, new species. Female. a, dorsal (scale G); b, urosome, dorsal (A); c, urosome, lateral (A); d, anal somite and caudal ramus, dorsal (E); e, antennule, anterodorsal (B); f, antenna, antero-inner (E); g, mandible, posterior (E); h, maxillule, posterior (E).

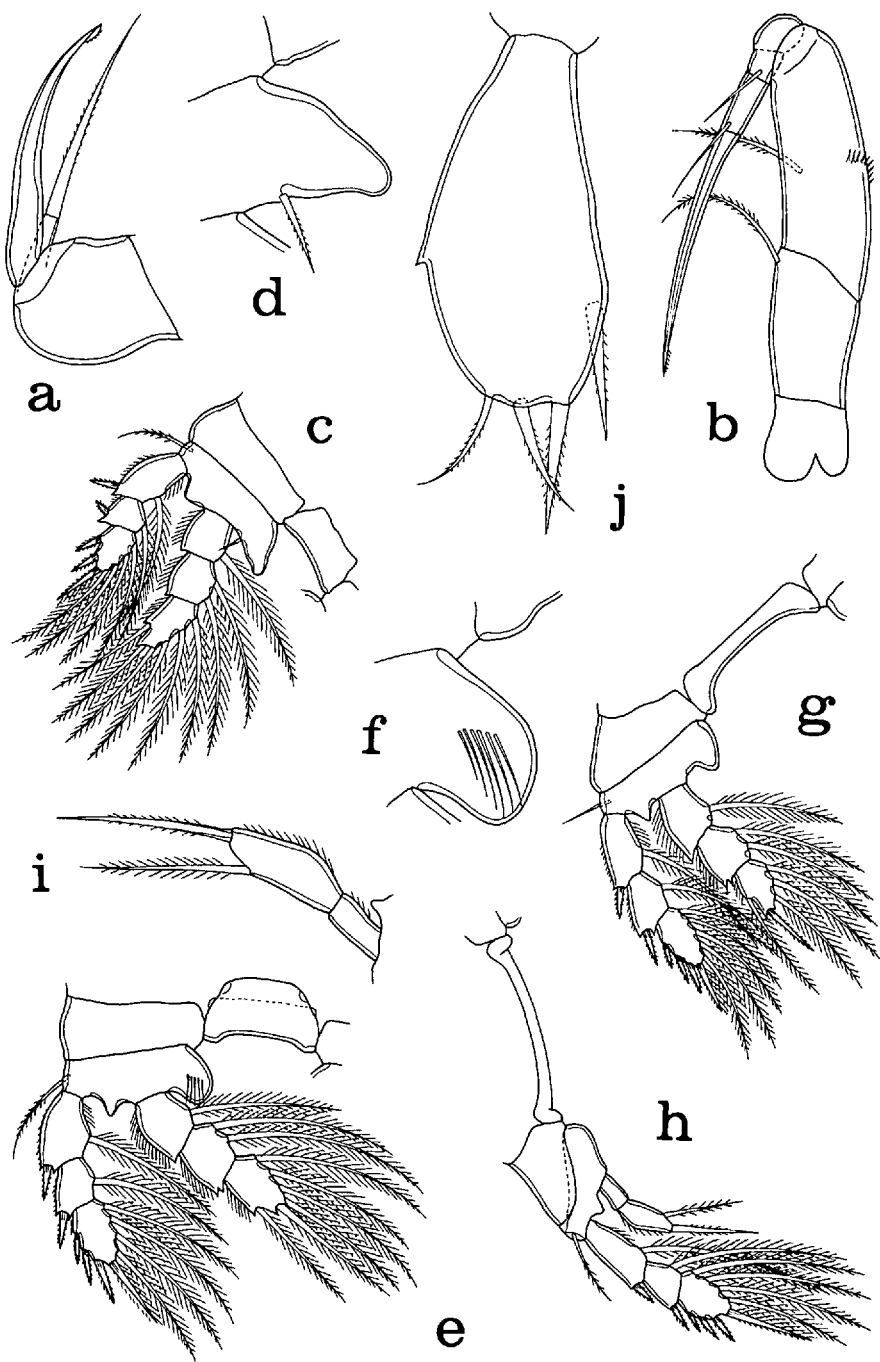


Figure 19. *Stygiopontius regius*, new species. Female. a, maxilla, anterior (scale E); b, maxilliped, posterior (E); c, leg 1 and intercoxal plate, anterior (A); d, inner side of basis, anterior (C); e, leg 2 and intercoxal plate, anterior (A); f, inner side of basis, anterior (C); g, leg 3 and intercoxal plate, anterior (A); h, leg 4 and intercoxal plate, posterior (A); i, endopod of leg 4, anterior (E); j, leg 5, dorsal (C).

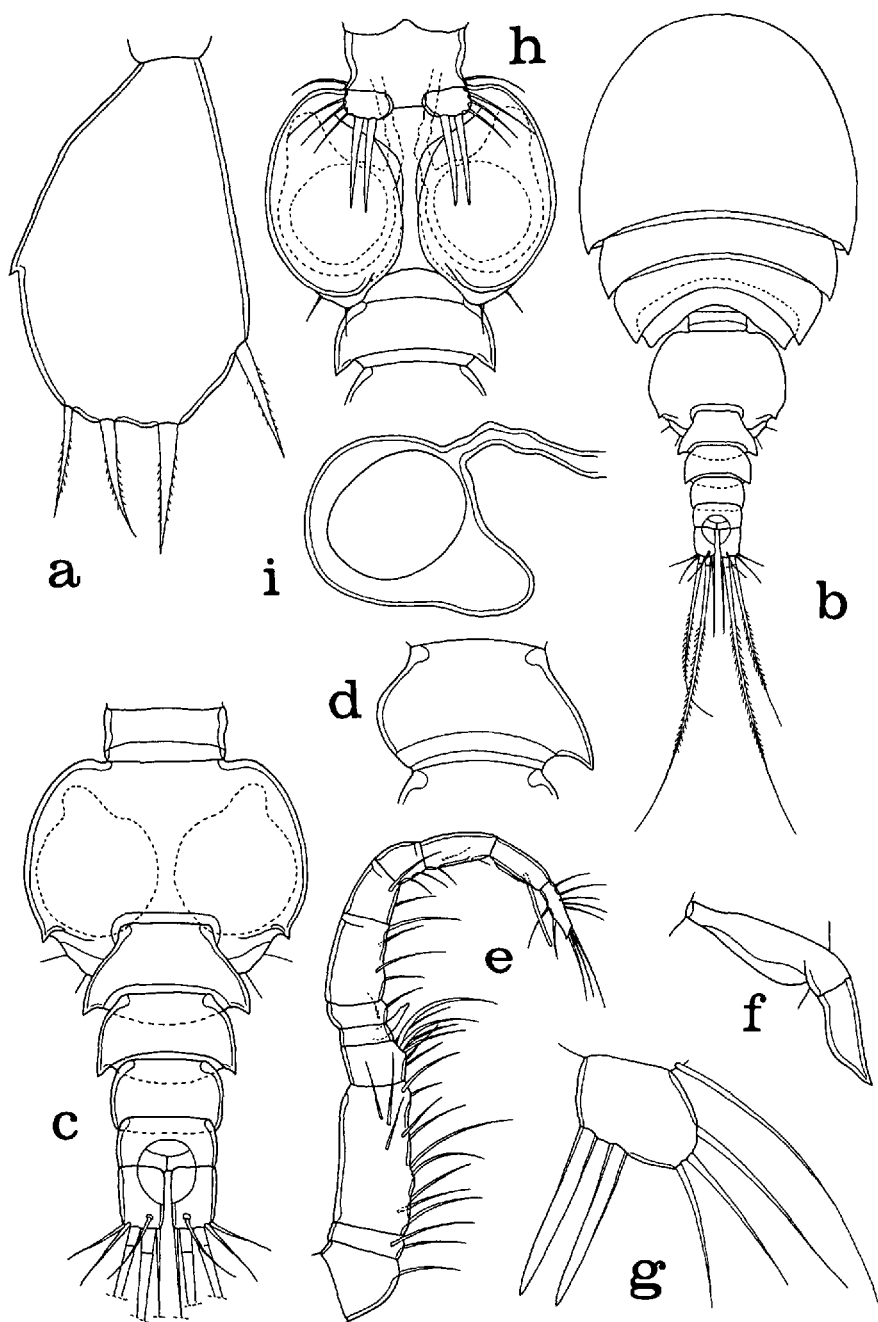


Figure 20. *Stygiopontius regius*, new species. Female. a, leg 5, flat view (scale C). Male. b, dorsal (scale G); c, urosome, dorsal (A); d, abnormal first postgenital somite, dorsal (B); e, antennule, anterodorsal (B); f, segment 5 of antennule, posteroventral (D); g, leg 5, ventral (C); h, somite bearing fifth pair of legs, genital somite, and first postgenital somite, ventral (A); i, spermatophore, extruded from female, ventral (C).

Female.—Body (Fig. 18a) with broad prosome. Length 1.57 mm (1.43–1.71 mm), greatest width 0.82 mm (0.75–0.97 mm), based on 9 specimens. Greatest dorso-ventral thickness 0.44 mm. Somite bearing first pair of legs fused with cephalosome. Epimera of somites bearing legs 1 and 2 pointed posteriorly, those of following 2 somites less so. Somite bearing leg 4 partially covered in dorsal view by tergum of preceding somite. Ratio of length to width of prosome 1.02:1. Ratio of length of prosome to that of urosome 1.12:1.

Somite bearing leg 5 (Fig. 18b, c) in dorsal view $57 \times 104 \mu\text{m}$, in lateral view (Fig. 18C) somite raised dorsally. Genital double-somite in dorsal view $135 \mu\text{m}$ long, $125 \mu\text{m}$ wide in anterior part, $94 \mu\text{m}$ wide in posterior part, with pair of posterolateral spiniform processes, side of somite concave. Genital areas located dorsolaterally near middle of segment and bearing minute seta. Three postgenital somites from anterior to posterior 65×99 , 47×75 , and $39 \times 72 \mu\text{m}$, first with posterolateral spiniform processes, second and third rounded.

Caudal ramus (Fig. 18d) little longer than wide, $94 \times 70 \mu\text{m}$, ratio 1.34:1. Outer lateral seta $130 \mu\text{m}$, dorsal seta $90 \mu\text{m}$, outermost terminal seta $90 \mu\text{m}$, innermost terminal seta $230 \mu\text{m}$, all smooth. Two long median terminal setae $495 \mu\text{m}$ (outer) and $880 \mu\text{m}$ (inner), both with lateral setules.

Body surface without visible sensilla.

Egg sac not seen.

Rostum as in *S. cladarus*. Antennule (Fig. 18e) $575 \mu\text{m}$ long. Lengths of its 10 segments: 96 ($169 \mu\text{m}$ along anterior margin), 60, 13, 52, 52, 49, 47, 47, 56, and $47 \mu\text{m}$, respectively. Armature: 15, 8, 2, 4, 2, 2, 2, 2, 2 + 1 aesthete, and 12. All setae smooth. Antenna (Fig. 18f) with basis having outer marginal setules. Exopod minute, $8 \times 5 \mu\text{m}$, with 3 setae. Endopod with first segment having outer row of setules, second segment with 4 setae, longest of these $130 \mu\text{m}$, and few setules.

Siphon as in *S. cladarus*. Mandible (Fig. 18g), maxillule (Fig. 18h), maxilla (Fig. 19a), and maxilliped (Fig. 19c) similar to those of *S. cladarus*.

Legs 1–4 (Fig. 19c, e, g, h) segmented and armed as in *S. cladarus*, with same spine and setal formula except inner coxal seta absent in all 4 legs. Leg 1 with inner margin of basis lobiform (Fig. 19d); delicately barbed inner spine on basis $27 \mu\text{m}$ long. Leg 2 with anterior inner surface of basis bearing row of several long slender spinules (Fig. 19f). Leg 4 with exopod $224 \mu\text{m}$ long. Endopod (Fig. 19i) with first segment $39 \times 25 \mu\text{m}$, second segment $81 \times 36 \mu\text{m}$, its subterminal inner plumose seta $94 \mu\text{m}$, its terminal barbed spine $117 \mu\text{m}$; this segment having setules along outer margin.

Leg 5 (Figs. 19j, 20a) seen in flat view $164 \times 109 \mu\text{m}$, ratio 1.5:1 (Fig. 20a), in dorsal view (Fig. 19j) $172 \times 94 \mu\text{m}$. Distinct notch on ventro-outer margin. Seta on dorsomedial margin nearly opposite notch $55 \mu\text{m}$. Three terminal setae, one more slender than other two, 53, 55, and $49 \mu\text{m}$. All setae delicately barbed.

Leg 6 represented by seta on genital area (Fig. 18b).

Color unknown.

Male.—Body (Fig. 20b) with broad prosome as in female. Length 1.53 mm (1.45–1.62 mm), greatest width 0.79 mm (0.69–0.84 mm), based on 8 specimens. Greatest dorsoventral thickness 0.45 mm. Ratio of length to width of prosome 1.07:1. Ratio of length of prosome to that of urosome 1.22:1.

Somite bearing leg 5 (Figs. 20c) $86 \times 180 \mu\text{m}$. Genital somite $300 \times 418 \mu\text{m}$ (length including leg 6), wider than long, with pair of small posterolateral spiniform processes. Four postgenital somites, first 2 with conspicuous posterolateral spiniform processes, from anterior to posterior 135×230 , 122×192 , 83×154 ,

and $68 \times 143 \mu\text{m}$. One male with asymmetrical first postgenital somite as in Fig. 20d.

Caudal ramus $91 \times 65 \mu\text{m}$, resembling that of female.

Body surface smooth as in female.

Rostrum like that of female. Antennule (Fig. 20e) 12-segmented. Lengths of segments: 9 ($75 \mu\text{m}$ along anterior margin), 23, 138, 44, 9, 31, 90, 65, 52, 80, 65, and $36 \mu\text{m}$, respectively. Armature: 1, 2, 12, 7, 1, 2, 4, 2, 2, 3, 1 aesthete, and 10. Fifth segment with stout spinelike seta as in Fig. 20f. All setae smooth.

Antenna, siphon, mandible, maxillule, maxilla, and maxilliped as in female.

Legs 1–4 like those of female, without sexual dimorphism.

Leg 5 (Fig. 20g) located ventrally, with small free segment $42 \times 57 \mu\text{m}$, bearing 2 broad hyaline setae $90 \mu\text{m}$ long and 3 outer slender setae 60, 65, and $80 \mu\text{m}$ from inner to outer. Adjacent seta on somite $122 \mu\text{m}$.

Leg 6 (Fig. 20h) posteroventral flap on genital somite bearing 2 small setae.

Spermatophore (Fig. 20i) asymmetrical, $122 \times 87 \mu\text{m}$.

Color unknown.

Etymology.—The specific name *regius* is a Latin word meaning kingly or royal.

Remarks.—*Stygiopontius regius* may be distinguished from its congeners by a combination of features: body size, structure of the female genital double-somite, the pair of posterolateral spiniform processes on the first postgenital somite in the female and on the first and second postgenital somites in the male, and the broad undivided leg 5 in the female with a distinct notch on the ventro-outer margin.

Fifteen congeners, with a maximum body length of 1.25 mm, are smaller than the new species. Only one other species, *Stygiopontius mucroniferus* Humes, 1987, with a body length of 1.78 mm, exceeds the length of the new species. In this species, however, there is a pair of prominent lateral processes on the anterior third of the female double-somite, the female caudal ramus has the ratio 3.16:1, and leg 5 in the female is elongate, slender, and divided.

The undivided leg 5 in *S. cladarus* is not unique in the genus. Such a condition occurs in *Stygiopontius brevispina* Humes, 1991, and to a lesser extent in *Stygiopontius lauensis* Humes, 1991, and *Stygiopontius lumiger* Humes, 1989.

Stygiopontius bulbisetiger new species

Figures 21a–h, 22a–h

Type Material.—2 ♀♀, Mid-Atlantic Ridge, MAR 93 dive M14-2622, $23^{\circ}23'N$, $44^{\circ}56'W$, Snake Pit site, in 3,520 m, 23 June 1993. Holotype (USNM 268320) deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D.C. Paratype (dissected) in the collection of the author.

Female.—Body (Fig. 21a) with moderately broad prosome. Length 0.89 mm (0.83–0.96 mm), greatest width 0.41 mm (0.41–0.42 mm), based on 2 specimens. Somite bearing first pair of legs incompletely separated from head by dorsal transverse suture. Epimera of somites bearing legs 1 and 2 somewhat pointed, those of somite bearing legs 3 and 4 more rounded. Ratio of length to width of prosome 1.37:1. Ratio of length of prosome to that of urosome 1.83:1.

Somite bearing leg 5 (Figs. 21b, c) $78 \times 112 \mu\text{m}$. Genital double-somite in dorsal view $68 \times 116 \mu\text{m}$, subrectangular, in dorsal view slightly indented at middle, slightly more expanded in posterior half than in anterior half. Genital areas located dorsolaterally in posterior part of somite. Each area bearing 2 setae, 1 long, $34 \mu\text{m}$, and 1 very short, $6 \mu\text{m}$. Three postgenital somites from anterior to posterior 43×99 , 36×83 , and $52 \times 75 \mu\text{m}$.

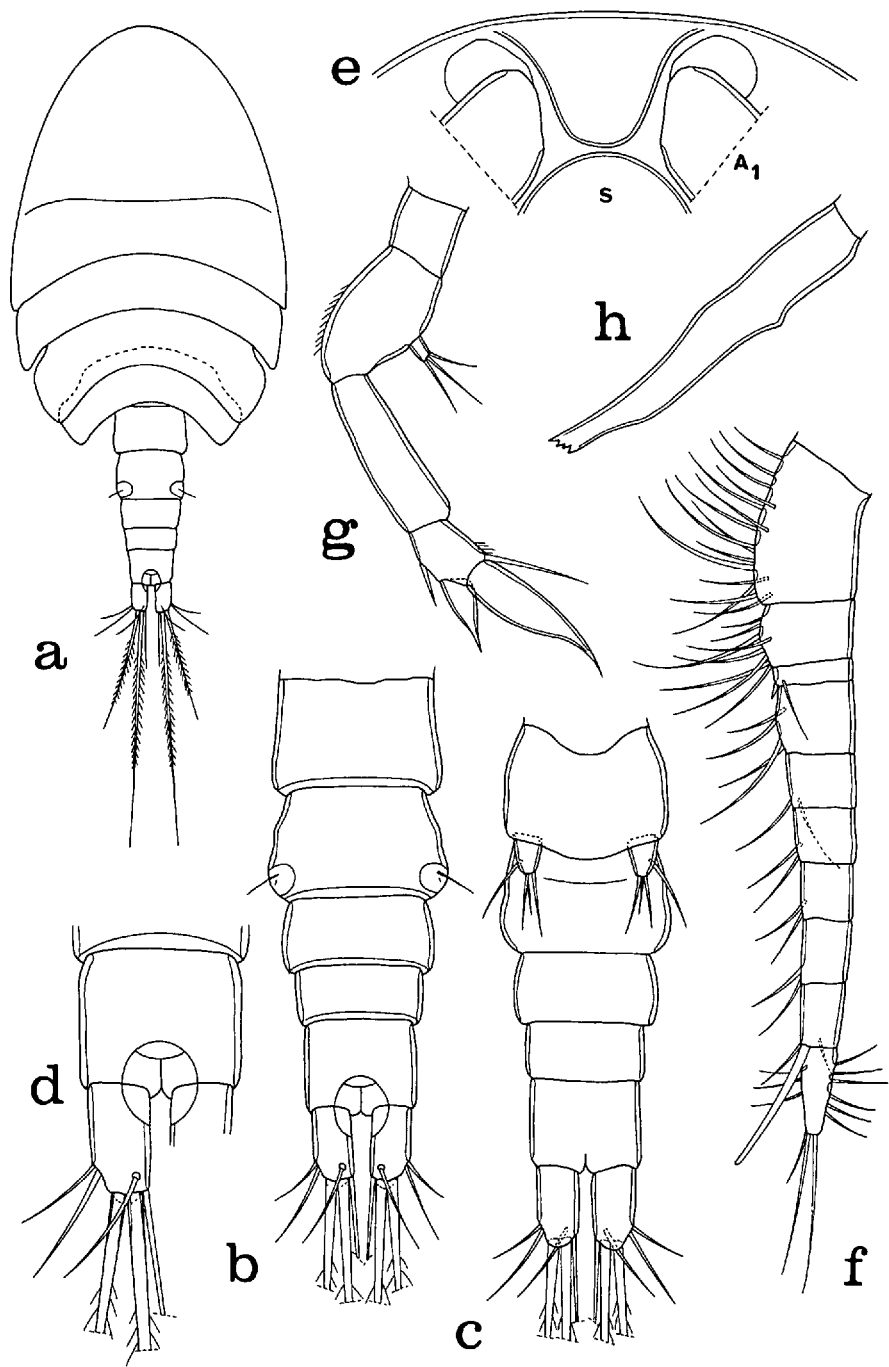


Figure 21. *Stygiopontius bulbisetiger* new species. Female. a, dorsal (scale A); b, urosome, dorsal (E); c, urosome, ventral (E); d, anal somite and caudal ramus, dorsal (C); e, rostrum, ventral (D); f, antennule, posteroventral (D); g, antenna, antero-inner (D); h, mandible, anterior (D).

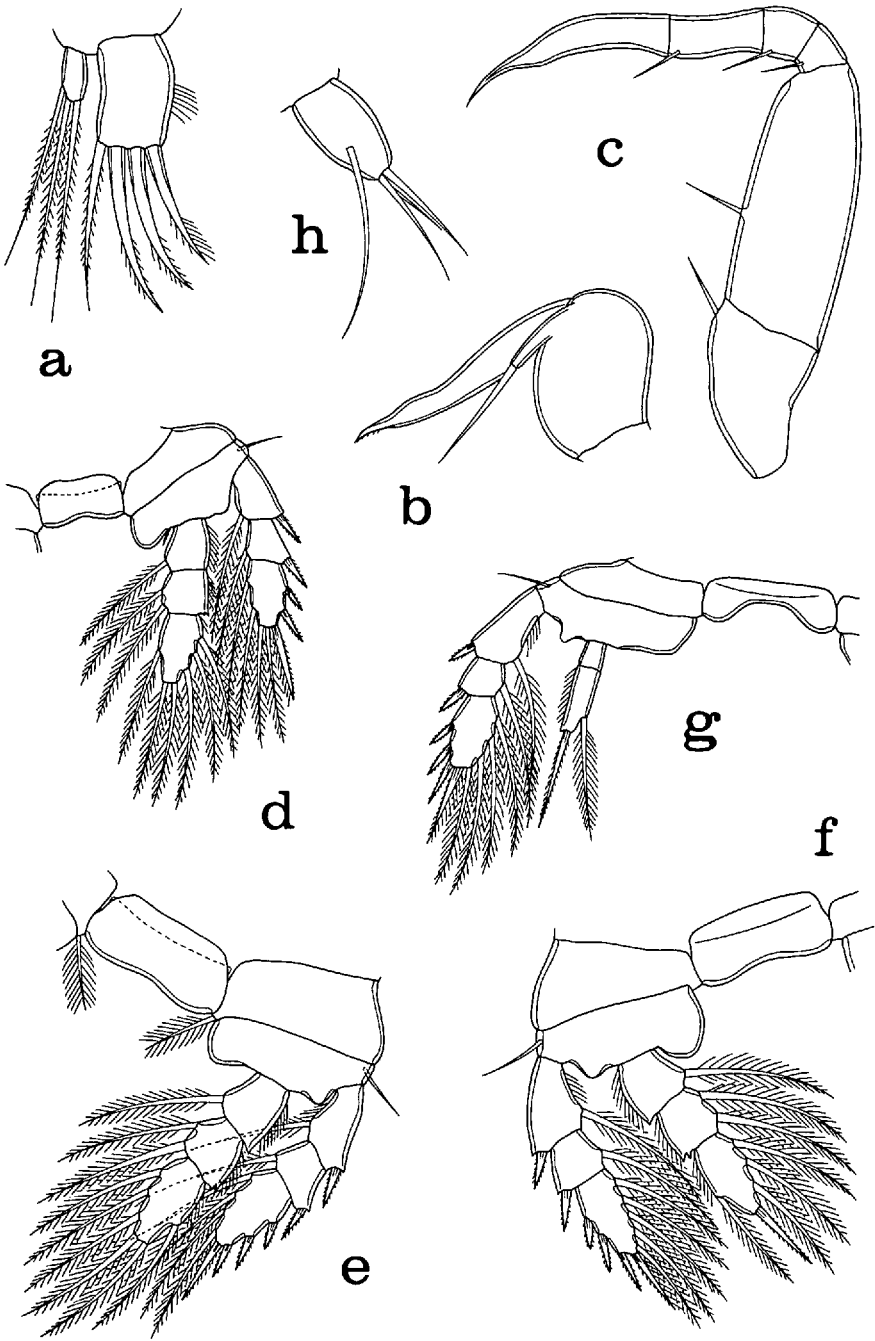


Figure 22. *Stygiopontius bulbisetiger* new species. Female. a, maxillule, anterior (scale D); b, maxilla, posterior (D); c, maxilliped, posterior (D); d, leg 1 and intercoxal plate, anterior (E); e, leg 2 and intercoxal plate, anterior (E); f, leg 3 and intercoxal plate, posterior (E); g, leg 4 and intercoxal plate, posterior (E); h, leg 5, dorsal (F).

Caudal ramus (Fig. 21d) moderately elongate, $50 \times 29 \mu\text{m}$, ratio 1.72:1. Outer lateral seta $40 \mu\text{m}$, dorsal seta $55 \mu\text{m}$, outermost terminal seta $60 \mu\text{m}$, and innermost terminal seta $75 \mu\text{m}$, all smooth. Two long median terminal setae 130 (outer) and 330 (inner), both with lateral setules. Distal end of ramus with slight ventral flange.

Body surface smooth.

Egg sac not seen.

Rostrum (Fig. 21e) tongue-shaped. Antennule (Fig. 21f) 10-segmented, $244 \mu\text{m}$ long. Lengths of segments: 34 ($60 \mu\text{m}$ along anterior margin), 18 , 8 , 23 , 18 , 18 , 18 , 18 , and $30 \mu\text{m}$, respectively. Armature: 15 , 8 , 2 , 4 , 2 , 2 , 2 , 2 , $2 + 1$ aesthete, and 12 . All setae smooth. Antenna (Fig. 21g) with basis bearing inner marginal setules. Exopod minute with 3 setae. Endopod with long unarmed first segment; short second segment with small inner seta, 2 unequal swollen terminal setae, $55 \mu\text{m}$ and $26 \mu\text{m}$, with attenuated tips, and outer terminal seta with few spinules near its insertion.

Siphon similar to that of *S. teres*. Mandible (Fig. 21h), maxillule (Fig. 22a), and maxilla (Fig. 22b) resembling those of congeners. Maxilliped (Fig. 22c) like that of congeners but claw relatively short, $65 \mu\text{m}$, and sinuous with attenuated tip.

Legs 1–4 (Figs. 22d–g) segmented and armed as in *S. cladarus*, with same spine and setal formula, except formula for inner coxal seta 0 , 1 , 0 , 0 . Leg 4 (Fig. 22g) with exopod $127 \mu\text{m}$ long. Endopod with first segment $21 \times 15.5 \mu\text{m}$. Second segment $44 \times 18 \mu\text{m}$, its subterminal inner plumose seta $78 \mu\text{m}$ and its terminal finely barbed spine $50 \mu\text{m}$.

Leg 5 (Fig. 22h) small, unsegmented, $22 \times 12 \mu\text{m}$, ratio 1.83:1, placed somewhat ventrally (Fig. 21c), bearing usual setae, 1 subterminal and 3 terminal.

Leg 6 represented by 2 unequal setae on genital area (Fig. 21c).

Color unknown.

Male.—Unknown.

Etymology.—The specific name is a combination of Latin *bulbus*, a swelling or bulb, *seta*, and *gero*, to bear, in allusion to the two bulbous setae on the fourth segment of the antenna.

Remarks.—*Stygiopontius bulbisetiger* may be distinguished from all congeners by the bulbous terminal setae on the antenna and by the relatively short sinuous claw on the maxilliped. The subquadrangular genital double-somite further distinguishes the new species.

Stygiopontius mirus new species

Figures 23a–f, 24a–h, 25a–f

Type Material.—2 ♂♂ from MAR 93 dive M14-2622, Mid-Atlantic Ridge, $23^{\circ}23'N$, $44^{\circ}56'W$, Snake Pit site, in 3,500 m, 23 June 1993. Holotype (USNM 268321) deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D.C. Paratype (dissected) in the collection of the author.

Male.—Body (Fig. 23a) with broad prosome. Length 0.97 mm (0.95 – 0.99 mm), greatest width 0.55 mm (0.53 – 0.56 mm), based on 2 specimens. Somite bearing first pair of legs incompletely set off from head by weak dorsal transverse suture. Epimera of somites bearing leg and legs 1 and 2 pointed, but those of somites carrying legs 3 and 4 rounded. Tergum of somite bearing leg 4 mostly covered by that of preceding somite. Ratio of length to width of prosome 1.11:1. Ratio of length of prosome to that of urosome 1.42:1.

Somite bearing leg 5 (Fig. 23b, c) $96 \times 145 \mu\text{m}$. Genital somite $122 \times 160 \mu\text{m}$ (including leg 6), wider than long, lateral margins rounded. Four postgenital

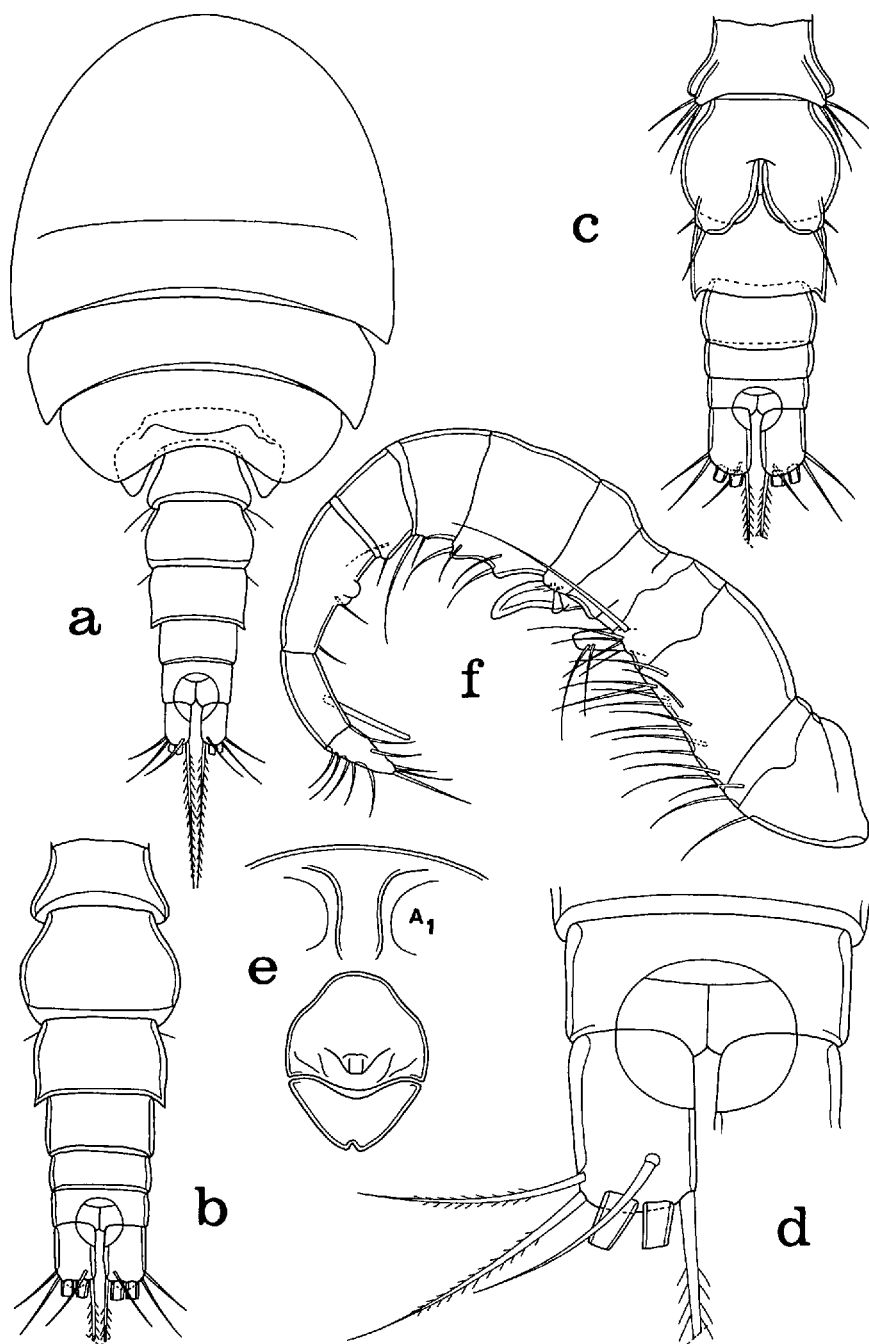


Figure 23. *Stygiopontius mirus* new species. Male. a, dorsal (scale A); b, urosome, dorsal (B); c, urosome, ventral (B); d, anal somite and caudal ramus, dorsal (D); e, rostrum and siphon, ventral (E); f, antennule, anterodorsal (C). A₁ = antennule.

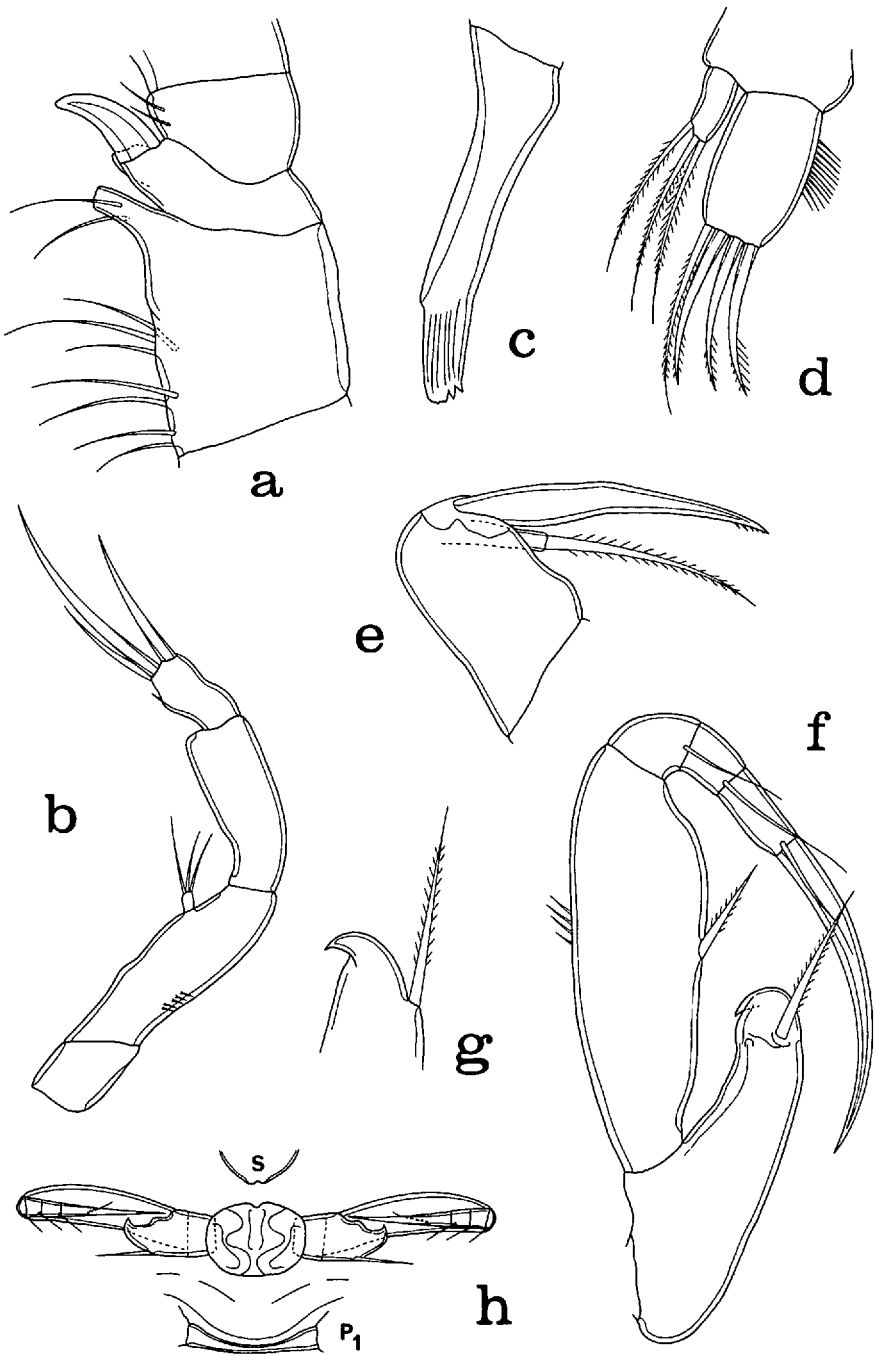


Figure 24. *Stygiopontius mirus* new species. Male. a, segments 3-6 of antennule (segments 3 and 4 fused in this view and not all setae shown), posteroventral (scale D); b, antenna, antero-inner (D); c, mandible, anterior (D); d, maxillule, posterior (D); e, maxilla, anterior (D); f, maxilliped, posterior, (D); g, tip of syncoxa of maxilliped, ventral (D); h, maxillipeds as seen in whole animal, ventral (B). S = siphon, P₁ = leg 1.

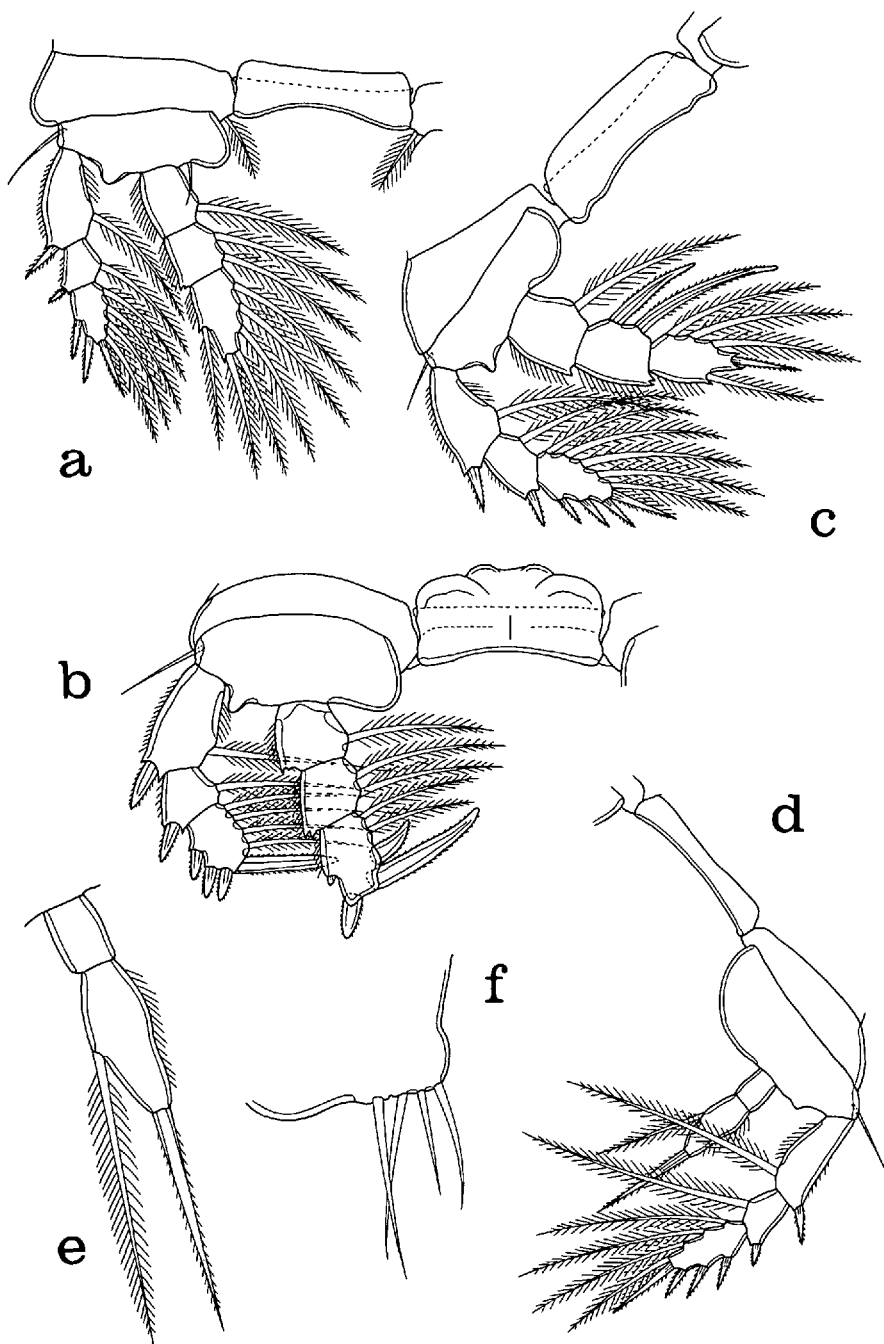


Figure 25. *Stygiolontius mirus*, new species. Male, leg 1 and intercoxal plate, anterior (scale E); b, leg 2 and intercoxal plate, anterior (E); c, leg 3 and intercoxal plate, anterior (E); d, leg 4 and intercoxal plate, anterior (E); e, endopod of leg 4, anterior (D); f, leg 5, ventral (D).

somites from anterior to posterior 101×133 (including posterolateral spiniform process), 65×117 , 39×107 , and $36 \times 101 \mu\text{m}$.

Caudal ramus (Fig. 23d) slightly elongate, $57 \times 42 \mu\text{m}$, ratio 1.34:1. Outer lateral seta $78 \mu\text{m}$, outermost terminal seta $90 \mu\text{m}$, and innermost terminal seta $200 \mu\text{m}$, all with lateral setules. Dorsal seta $78 \mu\text{m}$ and apparently smooth. Two median terminal setae broken at proximal joint.

Body surface smooth.

Rostral area weakly developed (Fig. 23e). Antennule (Fig. 23f) 12-segmented. Approximate lengths of segments: 26 ($55 \mu\text{m}$ along anterior margin), 10, 52, 16, 18, 35, 55, 34, 38, 73, 51, and $29 \mu\text{m}$, respectively. Armature: 1, 2, 12, 8, 2, 2, 4, 2, 2, 2, 1 aesthete, and 10. Segment 4 with anterior prolongation with truncate tip. Segment 5 with stout anterior spine $34 \mu\text{m}$ and short ridge (modified seta?). Relationships of segments 4 and 5 seen anterodorsally in Fig. 23f; in posteroventral view segments 3 and 4 apparently fused as in Fig. 24a. Antenna (Fig. 8) resembling that of congeners.

Siphon (Fig. 23e) with posterior margin showing median notch. Mandible (Fig. 24c) $122 \mu\text{m}$, maxillule (Fig. 24d), and maxilla (Fig. 24e) similar to those of congeners. Maxilliped (Fig. 24f) with coxa greatly prolonged medioventrally with small terminal clawlike process (Fig. 24g) and subterminal barbed seta. Maxilliped in undissected animal as in Fig. 24h. Long basis with inner barbed seta and outer margin with 4 setules. Endopod with each of first 3 segments having long seta. Claw smooth.

Ventral area between maxillipeds and first pair of legs as in Fig. 24h.

Legs 1–4 (Fig. 25a–d) with 3-segmented rami, except 2-segmented endopod in leg 4. Formula for armature as follows:

P_1	coxa 0-1	basis 1-I	exp I-1; enp 0-1;	I-1; 0-2;	II,I,4 1,2,3
P_2	coxa 0-0	basis 1-0	exp I-1; enp 0-1;	I-1; 0-2;	III,I,4 I,I,II,2
P_3	coxa 0-0	basis 1-0	exp I-1; enp 0-1;	I-1; 0-2;	III,I,5 1,I,3
P_4	coxa 0-0	basis 1-0	exp I-1; enp 0-0;	I-1; I,1	III,I,4

Leg 1 with inner spine on basis $27 \mu\text{m}$ long. Leg 2 (Fig. 25b) with third segment of endopod having 2 plumose setae and 4 spines, 1 spine very small, 2 spines moderate in length, and 1 massive long spine. Terminal spine on third segment of exopod unusually stout. Leg 3 with second segment of endopod bearing 2 long spines instead of usual setae. Leg 4 (Fig. 25d) with exopod $135 \mu\text{m}$ long. Endopod (Fig. 25e) with first segment $26 \times 21 \mu\text{m}$; second segment $52 \times 24 \mu\text{m}$, with setules along outer margin, bearing terminal barbed spine $75 \mu\text{m}$ and subterminal inner plumose seta $104 \mu\text{m}$.

Leg 5 (Fig. 25f) without identifiable segment, but forming slight ridge bearing 4 setae (3 + 1).

Leg 6 (Fig. 23c) posteroventral flap on genital somite bearing 2 setae $21 \mu\text{m}$ and $60 \mu\text{m}$.

Spermatophore not seen.

Color unknown.

Female.—Unknown.

Etymology.—The specific name *mirus*, Latin meaning wonderful or extraordinary, alludes to the unusual prolongation of the coxa of the maxilliped with its clawlike process and to the modified spines on the endopods in legs 2 and 3.

Remarks.—*Stygiopontius mirus* may be easily recognized by the prolongation of the coxa of the maxilliped, bearing a small clawlike process. This is unlike any other species in the genus.

***Stygiopontius latulus* new species**

Figures 26a–f, 27a–d

Type Material.—4 ♂♂ from Mid-Atlantic Ridge, MAR 93 dive M11-2619, 23°23'N, 44°56'W, Snake Pit site, in 3,500, 20 June 1993. Holotype (USNM 268322) and 2 paratypes (USNM 268323) deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D.C. Remaining paratype (dissected) in the collection of the author.

Male.—Body (Fig. 26a) with broad prosome. Length 0.89 mm (0.83–0.94 mm), greatest width 0.48 mm (0.43–0.51 mm), based on 3 specimens. Epimera of somites bearing legs 1 and 2 pointed, those of somites bearing legs 3 and 4 rounded. Tergum of somite bearing leg 4 partly covered in dorsal view by tergum of preceding somite. Ratio of length to width of prosome 1.05:1. Ratio of length of prosome to that of urosome 1.18:1.

Genital somite (Fig. 26b) $91 \times 135 \mu\text{m}$, wider than long. Four postgenital somites from anterior to posterior 78×127 (with pair of sharp posterolateral spiniform processes), 57×110 , 34×96 , and $27 \times 91 \mu\text{m}$.

Caudal ramus (Fig. 26c) only little longer than wide, $47 \times 39 \mu\text{m}$, ratio 1.21:1. Outer lateral seta $65 \mu\text{m}$, dorsal seta $65 \mu\text{m}$, and outermost terminal seta $65 \mu\text{m}$, all smooth. Innermost terminal seta $170 \mu\text{m}$, two long median terminal setae $300 \mu\text{m}$ (outer) and $480 \mu\text{m}$ (inner), all with lateral spinules.

Body surface smooth.

Rostral area as in *S. mirus*. Antennule (Fig. 26d) 12-segmented, resembling that of *S. mirus*, with similar armature. Segment 4 without anterior prolongation. Segment 5 with stout recurved spine. Lengths of segments: 16 ($49 \mu\text{m}$ along anterior margin), 10, 52, 21, 17, 20, 44, 31, 31, 62, 44, and $27 \mu\text{m}$, respectively.

Antenna, siphon, mandible, maxillule, and maxilla similar to those in *S. mirus*.

Maxilliped (Fig. 26e) also resembling that of *S. mirus*, but coxa much less prolonged, without clawlike process, and outer margin of basis lacking setules.

Ventral area between maxillipeds and first pair of legs as in *S. mirus*.

Legs 1–4 (Figs. 26f, 27a–c) with 3-segmented rami, except 2-segmented endopod in leg 4. Formula for armature as follows:

P_1	coxa 0-0	basis 1-I	exp I-1; enp 0-1;	I-1; 0-2;	II,I,4 1,2,3
P_2	coxa 0-1	basis 1-0	exp I-1; enp 0-1;	I-1; 0-2;	III,I,4 I,II,I,2
P_3	coxa 0-0	basis 1-0	exp I-1; enp 0-1;	I-1; 0-2;	III,I,5 1,I,3
P_4	coxa 0-0	basis 1-0	exp I-1; enp 0-0;	I-1; I,1	III,I,4

Inner coxal seta present only on leg 2. Leg 1 with inner spine on basis $23 \mu\text{m}$. Second segment of endopod of leg 3 with 2 inner setae, not 2 spines as in *S. mirus*.

Leg 5 (Fig. 27e) with minute free segment $14 \times 21 \mu\text{m}$, bearing 3 setae approximately $50 \mu\text{m}$ long. Adjacent seta $85 \mu\text{m}$.

Leg 6 (Fig. 26b) posteroventral flap on genital somite bearing 2 unequal setae $52 \mu\text{m}$ and $29 \mu\text{m}$.

Color unknown.

Spermatophore not seen.

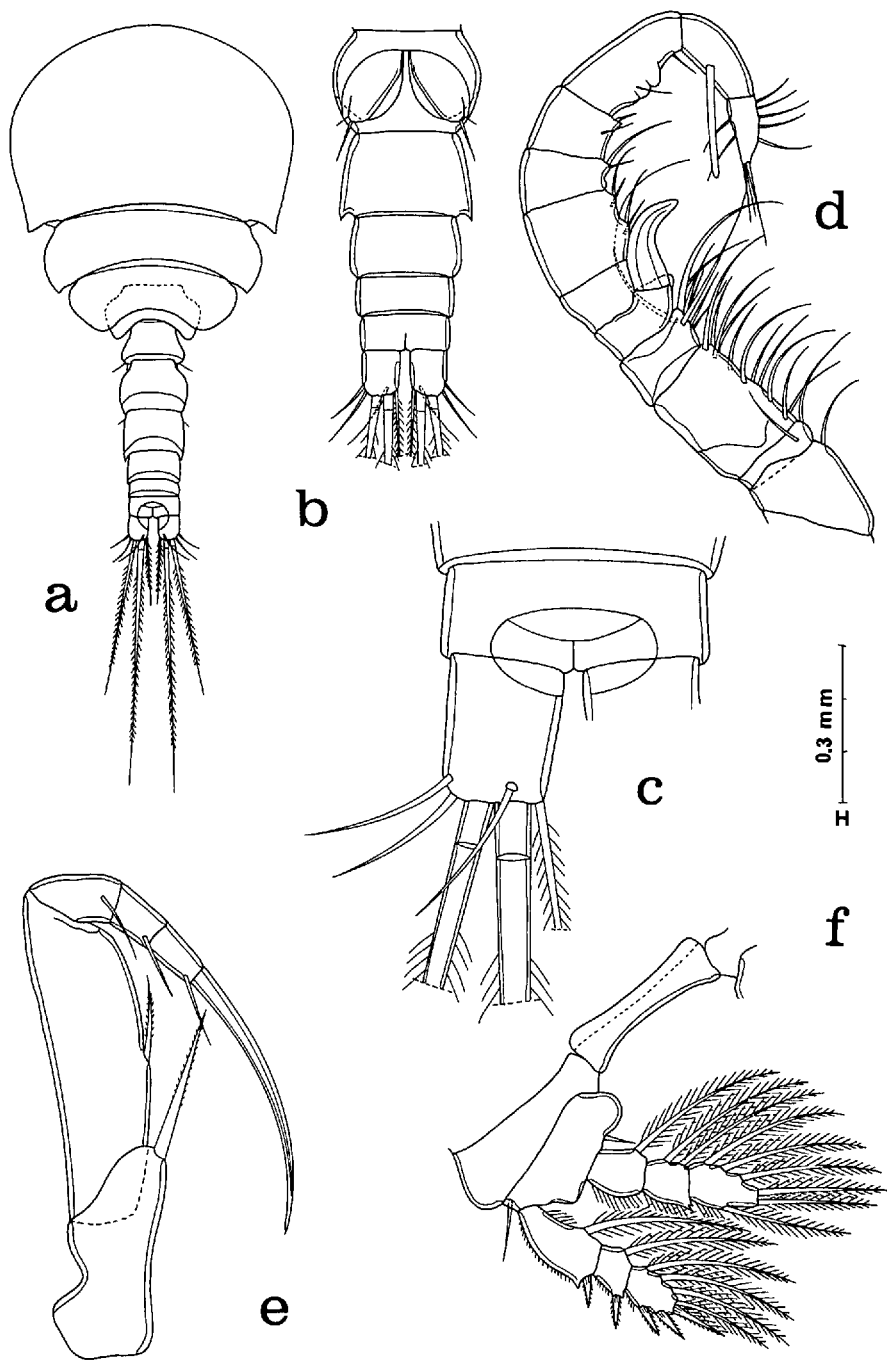


Figure 26. *Stygiopontius latulus* new species. Male. a, dorsal (scale H); b, genital and postgenital somites plus caudal ramus, ventral (B); c, anal somite and caudal ramus, dorsal (D); d, antennule, posteroventral (C); e, maxilliped, posterior (D); f, leg 1 and intercoxal plate, anterior (E).

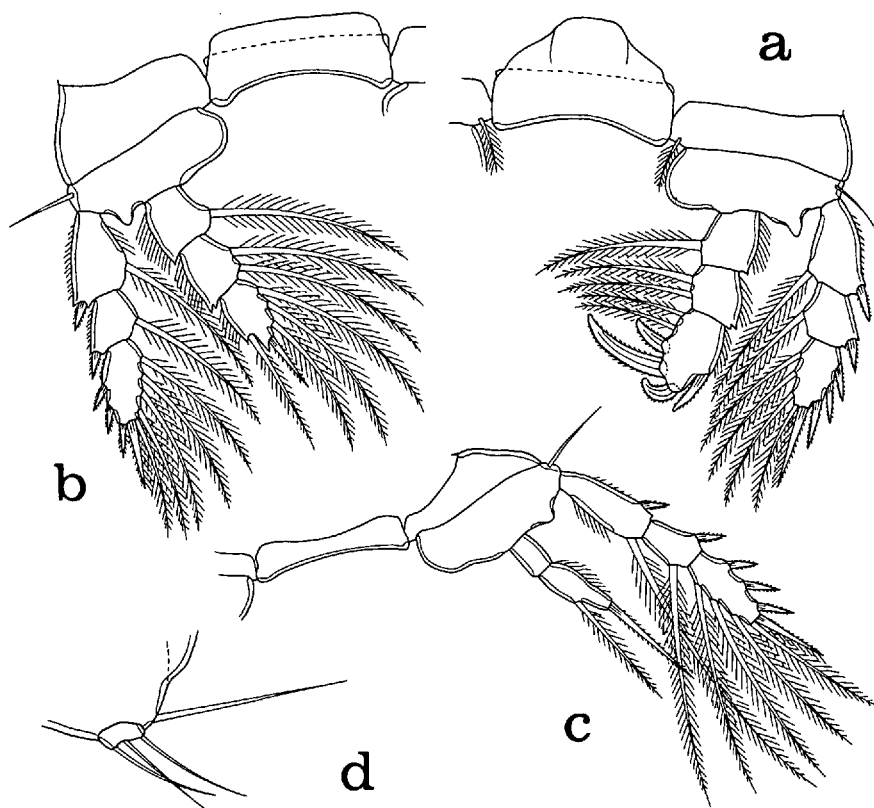


Figure 27. *Stygiopontius latulus* new species. Male. a, leg 2 and intercoxal plate, posterior (scale E); b, leg 3 and intercoxal plate, posterior (E); c, leg 4 and intercoxal plate, posterior (E); d, leg 5, ventral (C).

Female.—Unknown.

Etymology.—The specific name *latulus*, a combination of Latin *latus*, broad, and the diminutive suffix *-ulus*, alludes to the broad prosome.

Remarks.—The well-developed strong spines on the third segment of the endopod of leg 2 resemble the condition seen in *S. mirus*. In fact, the two species *S. latulus* and *S. mirus*, in showing this type of spine development, differ from all known congeners where males are known (8 of 18 species).

Stygiopontius latulus differs from *S. mirus* in several respects: the broad prosome, the shorter caudal ramus (ratio 1.21:1 as opposed to 1.34:1), the maxilliped with the coxa less prolonged and lacking a terminal clawlike process, the inner coxal setae on legs 1–4 arranged as 0,1,0,0, the nature of the well-developed spines on the third segment of the endopod of leg 2, and the second segment of the endopod of leg 3 having 2 inner setae instead of 2 spines.

Stygiopontius pectinatus Humes, 1987

Specimens Studied (all from Mid-Atlantic Ridge, 23°23'N, 44°56'W, Snake Pit site, MAR 93).—55 ♀♀, dive M05-2613, in 3,500 m, 14 June 1993; 1 ♀, dive M05-2613, in 3,520 m, 14 June 1993; 1 ♀, dive M07-2615, in 3,500 m, 16 June 1993; 6 ♀♀, dive M08-2616, in 3,520 m, 17 June 1993; 18 ♀♀, dive M09-2617, in 3,500 m, 18 June 1993; 2 ♀♀, dive M10-2618, in 3,500 m, 19 June 1993;

Table 1. Siphonostomatoid copepods on the northern Mid-Atlantic Ridge

Snake Pit		Lucky Strike	
23°23'N, 44°56'W (depth—3,500 m)	Specimens (no.)	37°20'N, 32°17'W (depth—1,620 m)	Specimens (no.)
<i>Rimipontius mediospinifer</i>	22	<i>Aphotopontius atlanteus</i>	132
* <i>Aphotopontius forcipatus</i>	13		
<i>Stygiopontius cladarus</i>	2,766		
<i>Stygiopontius serratus</i>	728		
<i>Stygiopontius teres</i>	22		
<i>Stygiopontius regius</i>	19		
<i>Stygiopontius bulbisetiger</i>	2		
<i>Stygiopontius mirus</i>	2		
<i>Stygiopontius latulus</i>	4		
* <i>Stygiopontius pectinatus</i>	7,452		
	11,030		132

* Known also from vent areas in the Pacific Ocean (see text).

106 ♀♀, dive M10-2618, in, 3,490 m, 19 June 1993; 496 ♀♀, dive M11-2619, in 3,490 m, 20 June 1993; 11 ♀♀, dive M11-2619, in 3,490 m, 20 June 1993; 5 ♀♀, dive M11-2619, from washings of *Rimicaris*, in 3,490 m, 20 June 1993; 170 ♀♀, dive M11-2619, from washings of *Rimicaris*, in 3,490 m, 20 June 1993; 121 ♀♀, dive M11-2619 m, from washings of *Rimicaris*, in 3,490 m, 20 June 1993; 772 ♀♀, dive M12-2620, in 3,500 m, 21 June 1993; 5,587 ♀♀, dive M12-2620, in 3,500 m, 21 June 1993; 76 ♀♀, dive M12-2620, in 3,500 m, 21 June 1993; 19 ♀♀, dive M13-2621, in 3,500, 22 June 1993; 6 ♀♀, dive M14-2622, in 3,500 m, 23 June 1993.

Remarks.—Males of this species remain unknown. Although 7,452 females were observed in this study, no males were found. Collections from the Mid-Atlantic Ridge (Humes, 1987) and the Mariana Back-Arc Basin (Humes, 1990b) contained only females.

CONCLUDING REMARKS

Nearly all copepods reported here came from washings of shrimps (adults and juveniles of *Rimicaris* and *Chorocaris*). Observation has verified that the copepods are located on the mouthparts of the shrimps, among the dense bacterial felt which covers these parts. From 1–10 copepods occur per shrimp. The shape of the carapace, which surrounds the mouthparts (Segonzac et al., 1993), supports the concept that these copepods are actually installed on the mouthparts and are not there through the effect of mixing or handling during aspiration. This does not exclude that a good part of the copepods very probably swim freely among the swarms of shrimps and may be aspirated with them. It may be that the copepods feed on the bacteria on the mouthparts of the shrimps, but also, when they are free, perhaps on bacteria free in the water.

Ten of the dirivultid species reported above were found at the Snake Pit site and only one species at the Lucky Strike site (Table 1). This difference in species abundance may perhaps be a reflection of the larger number of collections made and the greater abundance of shrimps at the Snake Pit site.

The biogeography of siphonostomatoid copepods from deep-sea vents is gradually becoming better known, but is still very imperfectly understood. Sufficient collections have now been made to show that certain dirivultid copepods occurring at vents in the eastern Pacific and the Mariana Back-Arc Basin also occur on the northern Mid-Atlantic Ridge. *Stygiopontius pectinatus* occurs on the Mid-Atlantic Ridge (Humes, 1987) and also in the Mariana Back-Arc Basin (Humes, 1990b). [Only females of *S. pectinatus* have been found, however, in spite of large numbers of individuals of this species having been collected (see above).

The explanation for the absence of males is not yet apparent.] *Aphotopontius forcipatus* has been found in the northeastern Pacific (Explorer Ridge, Juan de Fuca Ridge) (Humes, 1987; Humes and Huys, 1992) and also on the Mid-Atlantic Ridge (see above). Disjunct distribution of vent fauna is known in other species (crabs, limpets, bivalves) (summarized by Martin and Hessler, 1990).

The use of specific sampling methods during future missions would allow better understanding of the "life cycle" and mode of nutrition of these copepods, and thus the determination of the degree of commensalism in relation to the different invertebrates (vestimentiferans, alvinellid polychaetes, shrimps, crabs) with which they are generally associated.

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